This document provides pertinent information concerning the reissuance of the VPDES Permit listed below. This permit is being processed as a Minor, Municipal permit. The discharge results from the operation of a 0.025 MGD wastewater treatment plant. This permit action consists of updating the proposed effluent limits to reflect the current Virginia WQS effective January 6, 2011 and updating permit language, as applicable. The effluent limitations and special conditions contained in this permit will maintain the Water Quality Standards of 9VAC25-260-00 et seq.

| | | | | |
|---|---|---|---|---|
| **1.** | Facility Name and Mailing Address: | Hartland Institute<br>P.O. Box 1<br>Rapidan, VA 22733 | SIC Code: | 4952 WWTP |
| | Facility Location: | State Route 614; 1.7 miles off State Rt. 15 | County: | Madison |
| | Facility Contact Name: | Randy Gray | Telephone Number: | 540-308-5466 |
| **2.** | Permit No.: | VA0068951 | Expiration Date: | 6/15/2011 |
| | Other VPDES Permits: | None | | |
| | Other Permits: | PWSID public water supply 6113165 | | |
| | E2/E3/E4 Status: | N/A | | |
| **3.** | Owner Name: | Hartland Institute | | |
| | Owner Contact / Title: | Dr. Colin Standish/President | Telephone Number: | 540-672-3100 |
| **4.** | Application Complete Date: | 4/15/2011 | | |
| | Permit Drafted By: | Anna Westernik | Date Drafted: | 3/21/2011 |
| | Draft Permit Reviewed By: | Alison Thompson | Date Reviewed: | 4/25/2011 |
| | | Bryant Thomas | Date Reviewed: | 5/6/2011 |
| | Public Comment Period: | Start Date: June 17, 2011 | End Date: | July 18, 2011 |
| **5.** | Receiving Waters Information: | See **Attachment 1** for the Flow Frequency Determination. | | |
| | Receiving Stream Name: | Robinson River | Stream Code: | 3-ROB |
| | Drainage Area at Outfall: | 174.5 square miles | River Mile: | 3.4 |
| | Stream Basin: | Rappahannock River | Subbasin: | None |
| | Section: | 04 | Stream Class: | III |
| | Special Standards: | None | Waterbody ID: | VAN-E15R/RA36 |
| | 7Q10 Low Flow: | 5.6 MGD | 7Q10 High Flow: | 30 MGD |
| | 1Q10 Low Flow: | 4.0 MGD | 1Q10 High Flow: | 25 MGD |
| | 30Q10 Low Flow | 9.4 MGD | 30Q10 High Flow: | 38 MGD |
| | Harmonic Mean Flow: | 50 MGD | 30Q5 Flow: | 13 MGD |
| | 303(d) Listed: | Yes (Bacteria) | | |
| | TMDL Approved: | Yes (Bacteria) | Date TMDL Approved: | 5 May 2008 |

**6.** Statutory or Regulatory Basis for Special Conditions and Effluent Limitations:

| | | | |
|---|---|---|---|
| ✓ | State Water Control Law | ___ | EPA Guidelines |
| ✓ | Clean Water Act | ✓ | Water Quality Standards |
| ✓ | VPDES Permit Regulation | ___ | Other: |
| ✓ | EPA NPDES Regulation | | |

**7.** Licensed Operator Requirements: Class III

**8.** Reliability Class: Class I

**9. Permit Characterization:**

| | | | | | |
|---|---|---|---|---|---|
| ✓ | Private | ✓ | Effluent Limited | ___ | Possible Interstate Effect |
| ___ | Federal | ✓ | Water Quality Limited | ___ | Compliance Schedule Required |
| ___ | State | ___ | Toxics Monitoring Program Required | ___ | Interim Limits in Permit |
| ___ | POTW | ___ | Pretreatment Program Required | ___ | Interim Limits in Other Document |
| ✓ | TMDL | | | | |

**10. Wastewater Sources and Treatment Description:**

Sewage is collected in septic tanks adjacent to each building and flows by gravity to an aerated sewage lagoon. The lagoon is divided into two cells by a baffle curtain. The curtain reduces the short-circuiting and provides separation of the biological process into two cells. A blanket of duck weed on the lagoon screens out sunlight and absorbs nutrients from the waste stream.

After the sewage leaves the lagoon, it enters a chlorine contact tank and is disinfected using sodium hypochlorite tablets. Downstream of the chlorine contact tank dechlorination occurs with sodium bisulfate tablets and post aeration is used to remove the chlorine and replenish dissolved oxygen. Discharge is through a 4-inch pipe that daylights onto a concrete ramp leading to the Robinson River.

Daily sampling occurs at the wier behind the operator's building—the same location where daily flow is estimated. Monthly sampling occurs at the point where the 4-inch pipe daylights prior to discharge to the Robinson River. Discharge is through a shore-based outfall to a receiving stream with Class I rapids.

See **Attachment 2** for a facility schematic/diagram.

TABLE 1 -- OUTFALL DESCRIPTION

| Number | Discharge Sources | Treatment | Design Flow | Latitude / Longitude |
|---|---|---|---|---|
| 001 | Domestic Wastewater | See Item 10 above. | 0.025 MGD | 38° 20' 13" / 78° 05' 29" |

See **Attachment 3** for the Rapidan Topographic Map (185D).

**11. Sludge Treatment and Disposal Methods:**

All sludge/solids produced during normal operation of this lagoon system remain within the system. Essentially, there is no further treatment of the sludge other than the natural breakdown of the material within the lagoon. If the sludge needed to be removed, it would be hauled to the Town of Culpeper WWTP (VA0061590) for further treatment and comingled disposal with the sludge from the Town of Culpeper WWTP.

**12. Discharges and Monitoring Stations Located within Waterbody VAN-E15R:**

| TABLE 2 -- DISCHARGES & MONITORING STATIONS | | | |
|---|---|---|---|
| ID / Permit | Facility Name | Latitude / Longitude | Receiving Stream |
| VPDES Individual Permits | | | |
| VA0022845 | The Town of Madison WWTP | 38° 22' 48" / 78° 14' 11.9" | Little Dark Run |
| VA0063347 | Mountain View Nursing Home | 38° 20' 19" / 78° 12' 11" | Great Run, UT |
| VA0068951 | Hartland Institute | 38° 20' 13" / 78° 05' 29" | Robinson River |
| VA0087696 | Madison Wood Preservers Incorporated | 38° 22' 20" / 78° 15' 01" | Little Dark Run |
| Storm Water General Permits | | | |
| VAR051855 | Mountain Lumber Company Inc. - Madison | | Little Dark Run |
| Single Family Homes General Permits | | | |
| VAG406507 | Shifflett Katherine B and Roger L Residence | | Dark Run |
| VAG406303 | Haynes C J Residence | | Muddy Run |
| DEQ Ambient Monitoring Stations | | | |
| 3-ROB001.90 | DEQ Ambient Monitoring Station | 38° 19' 30" / 78° 05' 44" | Robinson River |
| 3-ROB004.04 | DEQ Ambient Monitoring Station | 38° 20' 10" / 78° 05' 26.8" | Robinson River |
| 3-ROB004.98 | DEQ Ambient Monitoring Station | 38° 20' 55" / 78° 06' 31" | Robinson River |
| 3-COO000.04 | DEQ Ambient Monitoring Station | 38° 21' 13.02" / 78° 06' 46.98" | Crooked Run |

**13. Material Storage:**

Materials Stored at Outfall 001:
The materials listed below are stored in the maintenance shop.

1. One 5-gallon bucket of sodium hypochlorine tablets.
2. One 5-gallon bucket of sodium bisulfite tablets.
3. One 500-gallon gasoline tank.
4. One 500-gallon diesel tank.

**14. Site Inspection:** Performed by Anna Westernik on April 7, 2011. See **Attachment 4** for inspection summary.

**15. Receiving Stream Water Quality and Water Quality Standards:**

a. Ambient Water Quality Data
Outfall 001 discharges into the Robinson River. DEQ monitoring station 3-ROB001.90 is located 1.6 miles downstream of the outfall. Monitoring results have revealed a bacteria impairment for the Robinson River.

Impairments due to bacteria led to the development of a Bacteria Total Maximum Daily Load (TMDL) for the Robinson River. This TMDL was approved by the Environmental Protection Agency (EPA) on December 12, 2005. This facility has a Wasteload Allocation (WLA) of 4.35E+10 cfu/year for *E. coli* bacteria.

The Rapidan River, 33 miles downstream of Outfall 001, is listed for a fish consumption use impairment due to mercury in fish tissue. A TMDL is scheduled to be completed by 2022.

The Rappahannock River has been listed as impaired for Fish Consumption Use due to Polychlorinated Biphenyls (PCBs) found in fish tissue samples. This TMDL is due in 2016. Staff has concluded that low-level PCB monitoring is not warranted for this facility since this discharge is less than 0.1 MGD. However, if the facility is expanded, it may be requested to monitor for this pollutant as set forth under the aforementioned TMDL.

There is a completed downstream TMDL for nutrient impairments for the Chesapeake Bay. This facility does not have nutrient concentration limits since there is no expansion planned. However, it was assigned a WLA in the TMDL based on the current design flow.

See **Attachment 5**, Planning Statement, for a complete discussion of ambient water quality.

b. Receiving Stream Water Quality Criteria

Part IX of 9VAC25-260(360-550) designates classes and special standards applicable to defined Virginia river basins and sections. The receiving stream, the Robinson River, is located within Section 04 of the Rappahannock River Basin and is designated as Class III water.

Class III waters must achieve a dissolved oxygen (D.O.) of 4.0 mg/L or greater, a daily average D.O. of 5.0 mg/L or greater, and a temperature that does not exceed 32°C at all times. Additionally, a pH of 6.0- 9.0 standard units (S.U.) must be maintained.

1) Ammonia:

The fresh water, aquatic life water quality criteria for ammonia is dependent on the instream temperature and pH. The 90$^{th}$ percentile temperature and pH values are used because they best represent the critical design conditions of the receiving stream.

Staff has re-evaluated the March 2003 through February 2011 receiving stream ambient monitoring data derived from DEQ Monitoring Station 3-ROB001.90 for pH and temperature and finds that the 90$^{th}$ percentile pH value of 7.5 S.U. is the same as that used to establish ammonia criteria and subsequent effluent limits in the previous permit. Staff used the stream data to determine the 90$^{th}$ percentile value derived of 25° C for annual temperature and a default value of 15° C for wet season temperature to calculate ammonia criteria.

The 90$^{th}$ percentile pH of the effluent derived from maximum monthly pH values reported on March 2010 through February 2011 discharge monitoring reports (DMRs) is 7.9 S.U. Since there is no effluent temperature data, staff used default values of 25° C and 15° C for temperature to calculate ammonia criteria. The 90$^{th}$ percentile calculations for pH and temperature are presented in **Attachment 6**.

The calculated ammonia criteria and wasteload allocations are found in **Attachment 7**.

2) Bacteria:

The Virginia Water Quality Standards (9VAC25-260-170.A.) establishes the following criteria to protect primary contact recreational uses:

*E. coli* bacteria per 100 mL of water shall not exceed the following:

| | Monthly Geometric Mean[1] |
|---|---|
| Freshwater *E. coli* (N/100 mL) | 126 |

[1]Four or more samples taken during any calendar month

3) Metals:

Metals criteria were determined using a default hardness value of 50 mg/L for the stream and effluent.

**Attachment 7** details other water quality criteria applicable to the receiving stream.

c. Receiving Stream Special Standards

The State Water Control Board's Water Quality Standards, River Basin Section Tables (9VAC25-260-360, 370 and 380) designates the river basins, sections, classes, and special standards for surface waters of the Commonwealth of Virginia. The receiving stream, the Robinson River, is located within Section 04 of the Rappahannock River Basin. This section has not been designated with a special standard.

d. Threatened or Endangered Species

The Virginia DGIF Fish and Wildlife Information System Database was searched on March 16, 2011 for records to determine if there are threatened or endangered species in the vicinity of the discharge. The following endangered and threatened species were identified within a 2-mile radius of the discharge: Shenandoah Salamander, Peregrine Falcon,

Upland Sandpiper (song bird); Loggerhead Shrike (song bird); Bald Eagle; Green Floater, and Migrant Loggerhead Shrike (song bird). The limits proposed in this draft permit are protective of the Virginia Water Quality Standards and therefore, protect the threatened species found near the discharge.

The stream that the facility discharges to is not within a reach identified as having an Anadromous Fish Use.

**16. Antidegradation (9VAC25-260-30):**

All state surface waters are provided one of three levels of antidegradation protection. For Tier 1 or existing use protection, existing uses of the water body and the water quality to protect these uses must be maintained. Tier 2 water bodies have water quality that is better than the water quality standards. Significant lowering of the water quality of Tier 2 waters is not allowed without an evaluation of the economic and social impacts. Tier 3 water bodies are exceptional waters and are so designated by regulatory amendment. The antidegradation policy prohibits new or expanded discharges into exceptional waters.

The receiving stream, the Robinson River, has been classified as Tier 2 since there are no recent recorded water quality violations in this tributary. Therefore, no significant lowering of water quality is to occur where permit limits are based on the following:

- The dissolved oxygen in the receiving stream is not lowered more than 0.2 mg/L from the existing levels;
- The pH of the receiving stream is maintained within the range 6.0 – 9.0 S.U.;
- There is compliance with all temperature criteria applicable to the receiving stream;
- No more than 25% of the unused assimilative capacity is allocated for toxic criteria established for the protection of aquatic life; and
- No more than 10% of the unused assimilative capacity is allocated for criteria for the protection of human health.

The antidegradation policy also prohibits the expansion of mixing zones to Tier 2 waters unless the requirements of 9VAC25-260-30.A.2 are met. The draft permit is not proposing an expansion of the existing mixing zone.

**17. Effluent Screening, Wasteload Allocation, and Effluent Limitation Development:**

To determine water quality-based effluent limitations for a discharge, the suitability of data must first be determined. Data is suitable for analysis if one or more representative data points are equal to or above the quantification level ("QL") and the data represent the exact pollutant being evaluated.

Next, the appropriate Water Quality Standards (WQS) are determined for the pollutants in the effluent. Then, the Wasteload Allocations (WLAs) are calculated. The WLAs values are then compared with available effluent data to determine the need for effluent limitations. Effluent limitations are needed if the 97$^{th}$ percentile of the daily effluent concentration values is greater than the acute wasteload allocation or if the 97$^{th}$ percentile of the four-day average effluent concentration values is greater than the chronic wasteload allocation. In the case of ammonia evaluations, limits are needed if the 97$^{th}$ percentile of the 30-day average effluent concentration values is greater than the chronic WLA. Effluent limitations are the calculated on the most limiting WLA, the required sampling frequency and statistical characteristics of the effluent data.

a. Mixing Zones and Wasteload Allocations (WLAs)

Wasteload allocations (WLAs) are calculated for those parameters in the effluent with the reasonable potential to cause an exceedance of water quality criteria. The basic calculation for establishing a WLA is the steady state complete mix equation:

$$WLA = \frac{C_o [ Q_e + ( f ) (Q_s ) ] - [ ( C_s ) ( f ) ( Q_s ) ]}{Q_e}$$

Where:
- $WLA$ = Wasteload allocation
- $C_o$ = In-stream water quality criteria
- $Q_e$ = Design flow
- $Q_s$ = Critical receiving stream flow (1Q10 for acute aquatic life criteria; 7Q10 for chronic aquatic life criteria; harmonic mean for carcinogen-human health criteria; 30Q10 for ammonia criteria; and 30Q5 for non-carcinogen human health criteria)
- $f$ = Decimal fraction of critical flow
- $C_s$ = Mean background concentration of parameter in the receiving stream.

The Water Quality Standards contain two distinct mixing zone requirements. The first requirement is general in nature and requires the "use of mixing zone concepts in evaluating permit limits for acute and chronic standards in 9VAC25-260-140.B". The second requirement is specific and establishes special restrictions for regulatory mixing zones "established by the Board".

The Department of Environmental Quality uses a simplified mixing model to estimate the amount of mixing of a discharge with the receiving stream within specified acute and chronic exposure periods. The simplified model contains the following assumptions and approximations:

- The effluent enters the stream from the bank, either via a pipe, channel or ditch.
- The effluent velocity isn't significantly greater (no more than 1 - 2 ft/sec greater) than the stream velocity.
- The receiving stream is much wider than its depth (width at least ten times the depth).
- Diffusive mixing in the longitudinal direction (lengthwise) is insignificant compared with advective transport (flow).
- Complete vertical mixing occurs instantaneously at the discharge point. This is assumed since the stream depth is much smaller than the stream width.
- Lateral mixing (across the width) is a linear function of distance downstream.
- The effluent is neutrally buoyant (e.g. the effluent discharge temperature and salinity are not significantly different from the stream's ambient temperature and salinity).
- Complete mix is determined as the point downstream where the variation in concentration is 20% or less across the width and depth of the stream.
- The velocity of passing and drifting organisms is assumed equal to the stream velocity.

If it is suitably demonstrated that a reasonable potential for lethality or chronic impacts within the physical mixing area doesn't exist, then the basic complete mix equation, with 100% of the applicable stream flow, is appropriate. If the mixing analysis determines there is a potential for lethality or chronic impacts within the physical mixing area, then the proportion of stream flow that has mixed with the effluent over the allowed exposure time is used in the basic complete mix equation. As such, the wasteload allocation equation is modified to account for the decimal fraction of critical flow (f).

Staff derived wasteload allocations where parameters are reasonably expected to be present in an effluent (e.g., total residual chlorine where chlorine is used as a means of disinfection) and where effluent data indicate the pollutant is present in the discharge above quantifiable levels. With regard to the Outfall 001 discharge, ammonia as N is likely present since this is a wastewater treatment plant and total residual chlorine may be present since chlorine is used for disinfection.

b. Antidegradation Wasteload Allocations (AWLAs)

Since the receiving stream has been determined to be Tier II water, staff must also determine antidegradation wasteload allocations (AWLAs). The steady state complete mix equation is used substituting the antidegradation baseline ($C_b$) for the in-stream water quality criteria ($C_o$):

$$AWLA = \frac{C_b ( Q_e + Q_s ) - ( C_s ) ( Q_s )}{Q_e}$$

Where:
- AWLA = Antidegradation-based wasteload allocation
- $C_b$ = In-stream antidegradation baseline concentration
- $Q_e$ = Design flow
- $Q_s$ = Critical receiving stream flow (1Q10 for acute aquatic life criteria; 7Q10 for chronic aquatic life criteria; harmonic mean for carcinogen-human health criteria; 30Q10 for ammonia criteria; and 30Q5 for non-carcinogen human health criteria)
- $C_s$ = Mean background concentration of parameter in the receiving stream.

The mixing analysis and calculated AWLAs for the pollutants noted in 17.a. above are presented in **Attachment 7**.

c. Effluent Limitations, Outfall 001 – Toxic Pollutants

9VAC25-31-220.D. requires limits be imposed where a discharge has a reasonable potential to cause or contribute to an in-stream excursion of water quality criteria. Those parameters with AWLAs that are near effluent concentrations are evaluated for limits.

The VPDES Permit Regulation at 9VAC25-31-230.D. requires that monthly and weekly average limitations be imposed for continuous discharges from POTWs and monthly average and daily maximum limitations be imposed for all other continuous non-POTW discharges.

1). Ammonia as N:
The WLAs and AWLAs for ammonia as N were calculated utilizing the 90th percentile pH and temperature data discussed in 16.b.1) of this fact sheet. The most limiting of all the calculated WLAs and sole data point of 9.0 mg/L were used to calculate ammonia limits. The sole data point of 9.0 mg/L ensures the evaluation adequately addresses the potential for ammonia to be present in the discharge containing domestic sewage. It was determined that limits for ammonia would not be required in this permit reissuance, as was the case for the 2000 and the 2006 permit reissuances. See **Attachment 8** for the ammonia limitation derivations for this reissuance.

2). Total Residual Chlorine (TRC):
Chlorine is used for disinfection and is potentially in the discharge. Staff calculated AWLAs and WLAs for TRC using current critical flows and the mixing allowance. In accordance with current DEQ guidance, staff used a default data point of 0.2 mg/L and the most limiting AWLAs to derive limits. It was determined that TRC limits would not be needed. However, the 2000 and 2006 reissuance limits will remain in this permit to ensure compliance with the antibacksliding regulations (9 VAC-25-31-220.L). A monthly average of 0.050 mg/L and a weekly average limit of 0.060 mg/L are proposed for this discharge (see **Attachment 8** for computation of permit limits in the 2000 and 2011 permit reissuances).

d. Effluent Limitations and Monitoring, Outfall 001 – Conventional and Non-Conventional Pollutants
No changes to Dissolved Oxygen (D.O.), Biochemical Oxygen Demand-5 day ($BOD_5$), Total Suspended Solids (TSS) and pH limitations are proposed.

$BOD_5$ limitations are based on the Federal Secondary Treatment Standards of at least 85% removal and stream modeling (**Attachment 9).** The stream model ensures that the D.O. and $BOD_5$ limitations established do not decrease the receiving stream D.O. more than 0.2 mg/L to meet the requirements of the antidegradation policy for Tier 2 waters.

It is staff's practice to equate the Total Suspended Solids limits with the $BOD_5$ limits since the two pollutants are closely related in terms of treatment of domestic sewage.

The pH limitations are set at the water quality criteria.

*E. coli* limitations are established in accordance with the Water Quality Standards 9VAC25-260-170.

e. Effluent Limitations and Monitoring Summary.
The effluent limitations are presented in the following table. Limits were established for $BOD_5$, TSS, pH, D.O., TRC, and *E. coli*.

The limits for Total Suspended Solids are based on Best Professional Judgement.

The mass loading (kg/d) for monthly and weekly averages were calculated by multiplying the concentration values (mg/L), the flow values (MGD), and a conversion factor of 3.785.

Sample Type and Frequency are in accordance with the recommendations in the VPDES Permit Manual.

The VPDES Permit Regulation 9VAC25-31-30 and 40 CFR Part 133 require that the facility achieve at least 85% removal for BOD and TSS (or 65% for equivalent to secondary). During the last permit term, this facility conducted influent monitoring that indicated the minimum removal rate was being achieved.

**18. Antibacksliding:**

All limits in this permit are at least as stringent as those previously established. Backsliding does not apply to this reissuance.

**19. Effluent Limitations/Monitoring Requirements:**

Design flow is 0.025 MGD.
Effective Dates: During the period beginning with the permit effective date and lasting until the permit expiration date.

| PARAMETER | BASIS FOR LIMITS | DISCHARGE LIMITATIONS | | | | MONITORING REQUIREMENTS | |
|---|---|---|---|---|---|---|---|
| | | Monthly Average | Weekly Average | Minimum | Maximum | Frequency | Sample Type |
| Flow (MGD) | NA | NL | NA | NA | NL | 1/D | Estimate |
| pH | 1 | NA | NA | 6.0 S.U. | 9.0 S.U. | 1/D | Grab |
| Influent $BOD_5$ | 2 | NA NA | NA NA | NA | NL | 1/YR | Grab |
| Effluent $BOD_5$ | 1, 3, 4 | 30 mg/L 2.8 kg/day | 45 mg/L 4.3 kg/day | NA | NA | 1/M | Grab |
| Total Suspended Solids (TSS) | 2 | 30 mg/L 2.8 kg/day | 45 mg/L 4.3 kg/day | NA | NA | 1/M | Grab |
| Dissolved Oxygen (DO) | 1, 3 | NA | NA | 6.0 mg/L | NA | 1/D | Grab |
| *E. coli* (Geometric Mean) [(a) (b)] | 1 | 126 n/100 mL | NA | NA | NA | 1/W | Grab |
| Total Residual Chlorine (after contact tank) | 5 | NA | NA | 1.0 mg/L | NA | 1/D | Grab |
| Total Residual Chlorine (after dechlorination) | 1 | 0.050 mg/L | 0.060 mg/L | NA | NA | 1/D | Grab |

The basis for the limitations codes are:

1. Water Quality Standards
2. Best Professional Judgement
3. Stream Model (**Attachment 9**)
4. Federal Effluent Requirements for Secondary Treatment
5. DEQ Disinfection Guidance

*MGD* = Million gallons per day.
*NA* = Not applicable.
*NL* = No limit; monitor and report.
*S.U.* = Standard units.

*1/D* = Once every day.
*1/W* = Once every week.
*1/M* = Once every month.
*1/YR* = Once every calendar year.

Estimate = Reported flow is to be based on the technical evaluation of the sources contributing to the discharge.
Grab = An individual sample collected over a period of time not to exceed 15-minutes.

[(a)] Samples shall be collected between the hours of 10 A.M. and 4 P.M.

[(b)] The permittee shall sample and submit *E. coli* results at the frequency of once every week for three (3) months.

If all reported results for *E. coli* do not exceed 126 n/100mL, reported as the geometric mean, the permittee may submit a written request to DEQ-NRO for a reduction in the sampling frequency to once per quarter.

Upon approval, the permittee shall collect four (4) weekly samples during one month within each quarterly monitoring period as defined below. The results shall be reported as the geometric mean.

The quarterly monitoring periods shall be January through March, April through June, July through September and October through December. The DMR shall be submitted no later than the 10th day of the month following the monitoring period.

Should any of the quarterly monitoring results for *E. coli* exceed 126 n/100mL, reported as the geometric mean, the monitoring frequency shall revert to once per week for the remainder of the permit term.

**20. Other Permit Requirements:**

Part I.B. of the permit contains additional chlorine monitoring requirements, quantification levels and compliance reporting instructions.

These additional chlorine requirements are necessary per the Sewage Collection and Treatment Regulations at 9VAC25-70 and the Water Quality Standards at 9VAC25-260-170. Minimum chlorine residual must be maintained at the exit of the chlorine contact tank to assure adequate disinfection. No more that 10% of the monthly test results for TRC at the exit of the chlorine contact tank shall be < 1.0 mg/L with any TRC < 0.6 mg/L considered a system failure. *E. coli* limits are defined in this section as well as monitoring requirements to take effect should an alternate means of disinfection be used.

9VAC25-31-190.L.4.c. requires an arithmetic mean for measurement averaging and 9VAC25-31-220.D. requires limits be imposed where a discharge has a reasonable potential to cause or contribute to an in-stream excursion of water quality criteria. Specific analytical methodologies for toxics are listed in this permit section as well as quantification levels (QLs) necessary to demonstrate compliance with applicable permit limitations or for use in future evaluations to determine if the pollutant has reasonable potential to cause or contribute to a violation. Required averaging methodologies are also specified.

**21. Other Special Conditions:**

a. 95% Capacity Reopener. The VPDES Permit Regulation at 9VAC25-31-200.B.4. requires all POTWs and PVOTWs develop and submit a plan of action to DEQ when the monthly average influent flow to their sewage treatment plant reaches 95% or more of the design capacity authorized in the permit for each month of any three consecutive month period. The facility is a PVOTW.

b. Indirect Dischargers. Required by VPDES Permit Regulation, 9VAC25-31-200 B.1. and B.2. for POTWs and PVOTWs that receive waste from someone other than the owner of the treatment works.

c. O&M Manual Requirement. Required by Code of Virginia §62.1-44.19; Sewage Collection and Treatment Regulations, 9VAC25-790; VPDES Permit Regulation, 9VAC25-31-190.E. On or before September 30, 2011, the permittee shall submit for approval an Operations and Maintenance (O&M) Manual or a statement confirming the accuracy and completeness of the current O&M Manual to the Department of Environmental Quality, Northern Regional Office (DEQ-NRO). Future changes to the facility must be addressed by the submittal of a revised O&M Manual within 90 days of the changes. Non-compliance with the O&M Manual shall be deemed a violation of the permit.

d. CTC, CTO Requirement. The Code of Virginia § 62.1-44.19; Sewage Collection and Treatment Regulations, 9VAC25-790 requires that all treatment works treating wastewater obtain a Certificate to Construct prior to commencing construction and to obtain a Certificate to Operate prior to commencing operation of the treatment works.

e. Licensed Operator Requirement. The Code of Virginia at §54.1-2300 et seq. and the VPDES Permit Regulation at 9VAC25-31-200.C., and Rules and Regulations for Waterworks and Wastewater Works Operators (18VAC160-20-10 et seq.) requires licensure of operators. This facility requires a Class III operator.

f. Reliability Class. The Sewage Collection and Treatment Regulations at 9VAC25-790 require sewage treatment works to achieve a certain level of reliability in order to protect water quality and public health consequences in the event of component or system failure. Reliability means a measure of the ability of the treatment works to perform its designated function without failure or interruption of service. The facility is required to meet reliability Class I.

g. Sludge Reopener. The VPDES Permit Regulation at 9VAC25-31-220.C. requires all permits issued to treatment works treating domestic sewage (including sludge-only facilities) include a reopener clause allowing incorporation of any applicable standard for sewage sludge use or disposal promulgated under Section 405(d) of the CWA. The facility includes a sewage treatment works.

h. Sludge Use and Disposal. The VPDES Permit Regulation at 9VAC25-31-100.P; 220.B.2., and 420 through 720 and 40 CFR Part 503 require all treatment works treating domestic sewage to submit information on their sludge use and disposal practices and to meet specified standards for sludge use and disposal. The facility includes a treatment works treating domestic sewage.

i. TMDL Reopener. This special condition is to allow the permit to be reopened if necessary to bring it into compliance with any applicable TMDL that may be developed and approved for the receiving stream.

**22.** Permit Section Part II. Part II of the permit contains standard conditions that appear in all VPDES Permits. In general, these standard conditions address the responsibilities of the permittee, reporting requirements, testing procedures and records retention.

**23. Changes to the Permit from the Previously Issued Permit:**

a. Special Conditions: None
b. Monitoring and Effluent Limitations:
   1) Sampling frequency for *E. coli* has been increased from 1/M to 1/W to comply with the current Water Quality Standards (9VAC25-260-170.A.2.). The maximum limit of 235n/100 ml has been replaced with a monthly average geometric mean of 126 n/100 ml.
c. Other:
   1) The drainage area for the Robinson River discharge point has been recalculated from 175.7 $mi^2$ to 174.5 $mi^2$. Hence, the stream flow information has been updated to reflect this change.

**24. Variance/Alternate Limits or Conditions:** Not Applicable.

**25. Public Notice Information:**

First Public Notice Date: 6/16/2011 Second Public Notice Date: 6/23/2011

Public Notice Information is required by 9VAC25-31-280.B. All pertinent information is on file and may be inspected and copied by contacting the: DEQ Northern Regional Office, 13901 Crown Court, Woodbridge, VA 22193, Telephone No. (703) 583-3837, anna.westernik@deq.virginia.gov. See **Attachment 10** for a copy of the public notice document.

Persons may comment in writing or by email to the DEQ on the proposed permit action, and may request a public hearing, during the comment period. Comments shall include the name, address, and telephone number of the writer and of all persons represented by the commenter/requester, and shall contain a complete, concise statement of the factual basis for comments. Only those comments received within this period will be considered. A public hearing may be held, including another comment period, if public response is significant and there are substantial, disputed issues relevant to the permit. Requests for public hearings shall state 1) the reason why a hearing is requested; 2) a brief, informal statement regarding the nature and extent of the interest of the requester or of those represented by the requester, including how and to what extent such interest would be directly and adversely affected by the permit; and 3) specific references, where possible, to terms and conditions of the permit with suggested revisions. Following the comment period, the Board will make a determination regarding the proposed permit action. This determination will become effective, unless a public hearing is granted. Due notice of any public hearing will be given. The public may request an electronic copy of the draft permit and fact sheet or review the draft permit and application at the DEQ Northern Regional Office by appointment.

**26. 303 (d) Listed Stream Segments and Total Max. Daily Loads (TMDL):**
This facility discharges to a 303(d) listed stream due to bacteria impairments. The Robinson River Bacteria TMDL includes a wasteload allocation of 4.35 E+10 cfu/year for *E. coli* bacteria. The proposed limit of 126 n/100mL, reported as geometric mean, ensures that this discharge will not exceed this allocation.

The Rapidan River, approximately 33 miles downstream of the outfall, is listed with a fish consumption use impairment due to mercury in fish tissue. Excursions above the water quality criterion based fish tissue value (TV) of 300 parts per billion (ppb) for mercury (Hg) in fish tissue were recorded in three species of fish (American eel, rock bass, smallmouth bass) collected at monitoring station 3-RAP006.53 during 2006. A TMDL is scheduled to be completed by 2022.

The tidal Rappahannock River, located approximately 57 miles downstream of this facility, is listed with a PCB impairment. In support for the PCB TMDL that will be developed for the tidal Rappahannock River by 2016, this facility is a candidate for low-level PCB monitoring, based upon its designation as a minor municipal facility. Low-level PCB analysis uses EPA Method 1668B, which is capable of detecting low-level concentration for all 209 PCB congeners. The Assessment/TMDL Staff has concluded that low-level PCB monitoring is not warranted for this facility, as the discharge is less than 0.1 MGD and there are not any stream segments downstream of the facility that are listed with a PCB impairment. Fish tissue monitoring has been conducted on the Rapidan River and there have been no exceedances of the fish tissue criterion for PCBs. Based upon this information, this facility will not be requested to monitor for low-level PCBs.

There is a completed downstream TMDL for the nutrient impairments for the Chesapeake Bay. However, the Bay TMDL and the WLAs contained within the TMDL are not addressed in this permit due to the low volume of discharge flow from the treatment works.

See **Attachment 5**, Planning Statement, for a complete summary.

**27. Additional Comments:**

| | |
|---|---|
| Previous Board Action(s): | A Special Consent Order was issued to Hartland Institute on July 29, 2008 (see **Attachment 11** --Appendix A, Schedule of Compliance). DEQ conducted an inspection on May 27, 2009 that confirmed that the facility had met the requirements of the Consent Order. This case was dereferred on September 3, 2009. |
| Staff Comments: | None |
| Public Comment: | No comments were received during the public notice period. |
| EPA Checklist: | The checklist can be found in **Attachment 12**. |

## ATTACHMENTS

| | |
|---|---|
| Attachment 1 | Flow Frequency Determination |
| Attachment 2 | Facility Schematic/Diagram |
| Attachment 3 | Rapidan Topographic Map (185D) |
| Attachment 4 | Site Inspection Report Dated April 15, 2011 |
| Attachment 5 | DEQ Planning Statement Dated March 15, 2011 |
| Attachment 6 | $90^{th}$ Percentile pH and Temperature Calculations |
| Attachment 7 | Water Quality Criteria, Mixing Analysis, WLA/AWLA Derivations |
| Attachment 8 | Derivation of Ammonia and Total Residual Chlorine Limits |
| Attachment 9 | Stream Model |
| Attachment 10 | Public Notice |
| Attachment 11 | Appendix A, Schedule of Compliance, for Consent Order Dated July 29, 2008 |
| Attachment 12 | EPA Checklist |

**Flow Frequencies at the Hartland Institute Discharge Point (VA0068951)**
**Updated March 16, 2011 by Anna Westernik**

| **Robinson River Near Locust Dale, VA (Gaging Station #01666500)** | | | |
|---|---|---|---|
| | | | |
| 30Q10 High Flow (MGD) | 61 | 30Q10 Low Flow (MGD) | 15 |
| 7Q10 High Flow (MGD) | 47 | 7Q10 Low Flow (MGD) | 8.9 |
| 1Q10 High Flow (MGD) | 40 | 1Q10 Low Flow (MGD) | 6.3 |
| 30Q5 (MGD) | 21 | Harmonic Mean | 79 |
| | | | |
| | | | |
| **Robinson River at Discharge Point (Outfall 001)** | | | |
| | | | |
| 30Q10 High Flow (MGD) | 38.6 | 30Q10 Low Flow (MGD) | 9.5 |
| 7Q10 High Flow (MGD) | 29.8 | 7Q10 Low Flow (MGD) | 5.6 |
| 1Q10 High Flow (MGD) | 25.3 | 1Q10 Low Flow (MGD) | 4.0 |
| 30Q5 (MGD) | 13.7 | Harmonic Mean | 50.0 |

Flow frequencies were calculated using data collected at Gaging Station #01666500 during the period of 1943. to 2003. The gage is approximately 1.5 miles downstream of the discharge point. The values at the discharge point were calculated using drainage area proportions and do not address any withdrawals, discharges, or springs lying between the gage and the discharge point.

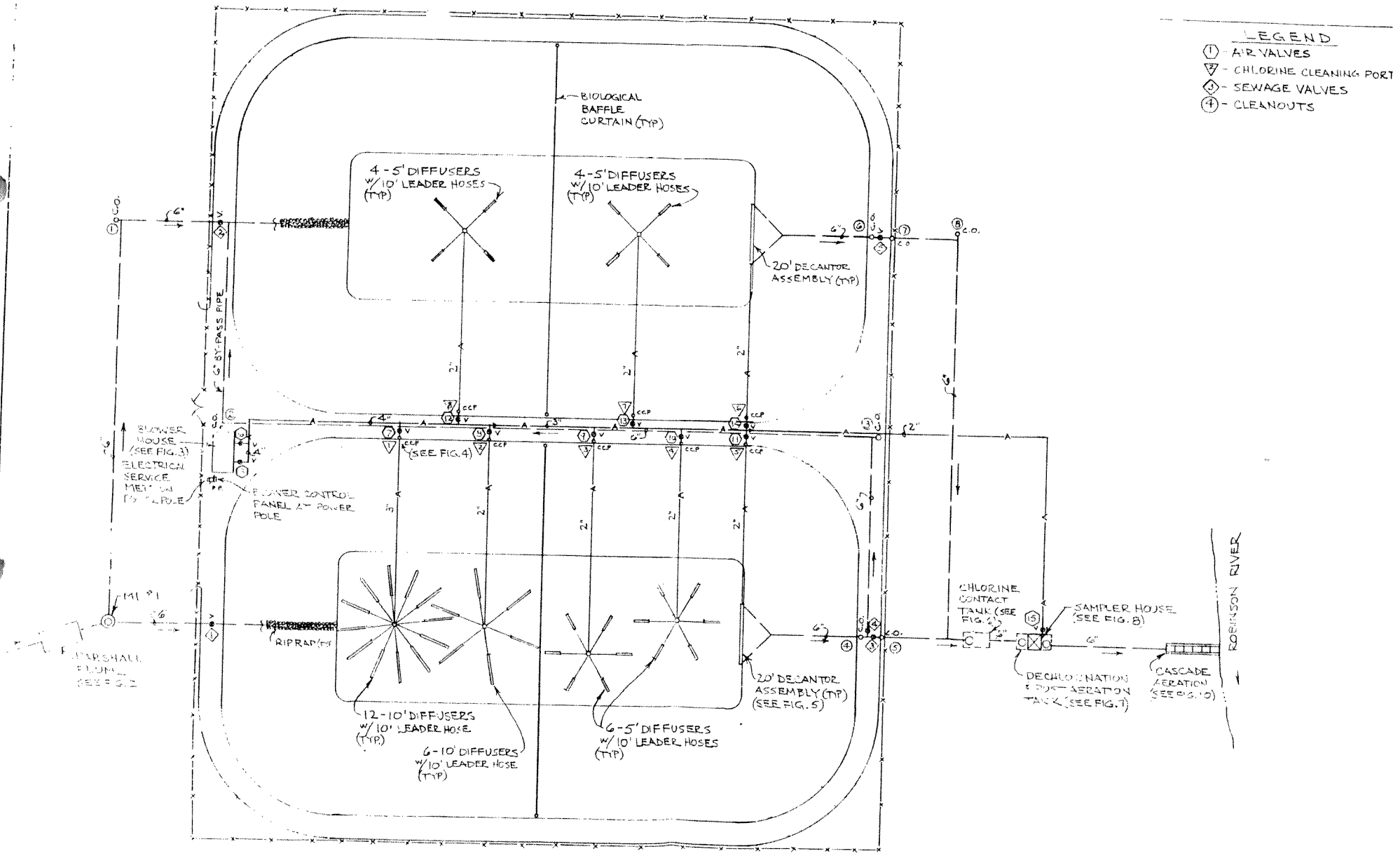
The following formula was used to determine the flow at the discharge point:

$$\frac{\text{(Drainage Area at Discharge Point) Flow at Gaging Station}}{\text{Drainage Area at Gaging Station}}$$

179 = DA at Gaging Station

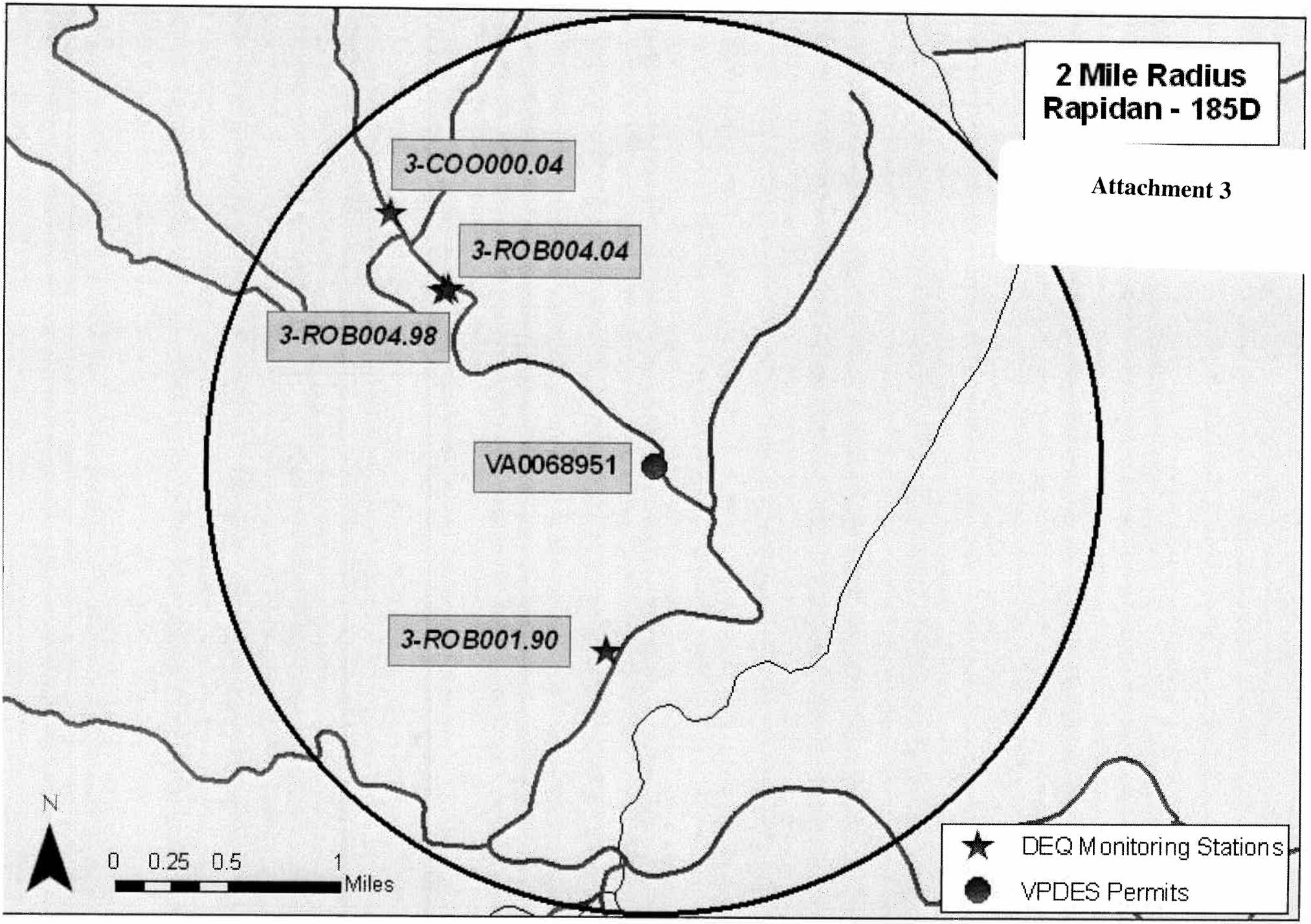
High flow months are Dec-May

**Attachment 1**




LAGOON VALVES
SCALE: 1" = 30'

**Attachment 2**


2 Mile Radius
Rapidan - 185D
Attachment 3
3-COO000.04
3-ROB004.04
3-ROB004.98
VA0068951
3-ROB001.90
N
0 0.25 0.5 1
Miles
DEQ Monitoring Stations
VPDES Permits

**Attachment 4**

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

# MEMORANDUM

Northern Regional Office

**TO:** File

**FROM:** Anna Westernik, Water Permit Writer

**DATE:** April 15, 2011

**SUBJECT:** April 7, 2011 Site Visit to the Hartland Institute

On April 7, 2011, a site visit was made to the Hartland Institute to observe the sewage treatment lagoon and discharge prior to permit reissuance. The following is a summary and description of the sewage treatment plant process:

Hartland Institute is an independent, self-supporting educational organization run by members of the Seventh-day Adventist Church located in Rapidan, Virginia. It consists of Hartland College (a Christian missionary college), a natural health center, a K-9 school, a publishing house, and several single-family dwellings.

Sewage is collected in septic tanks adjacent to each building and flows by gravity to an aerated sewage lagoon. The lagoon is divided into two cells by a baffle curtain. The curtain reduces the short-circuiting and provides separation of the biological process into two cells. A blanket of duck weed on the lagoon screens out sunlight and absorbs nutrients from the waste stream.

After the sewage leaves the lagoon, it enters a chlorine contact tank and is disinfected using sodium hypochlorite tablets. Downstream of the chlorine contact tank dechlorination occurs with sodium bisulfate tablets and post aeration is used to remove the chlorine and replenish dissolved oxygen. Discharge is through a 4-inch pipe that daylights onto a concrete ramp leading to the Robinson River.

Daily sampling occurs at the wier behind the operator's building—the same location where daily flow is estimated. Monthly sampling occurs at the point where the 4-inch pipe daylights prior to discharge to the Robinson River.

Wooden steps have been constructed to obtain access to the outfall. Some algal growth was observed at the monthly sampling location. The discharge is through a shore-based outfall to a receiving stream with Class I rapids. There was significant turbidity observed upstream of the discharge area due to severe erosion of the riverbank.

Five-gallon buckets of chemicals were observed being stored on the ground. All chemical storage must be in the operator's building. There is a second lagoon on site that is not used.

There is concern with the operator not being able to access the property from Thursday night through Sunday night due to religious observances. Presently, Hartland Institute personnel turn off the lagoon discharge during that time.

Groundskeepers have been ripping up the lagoon liner with mowers. These tears need to be repaired and caution must be observed when mowing in the lagoon area.

To: Anna Westernik
From: Jennifer Carlson
Date: March 15, 2011
Subject: Planning Statement for the Hartland Institute STP
Permit No: VA0068951

**Discharge Type: Municipal**
**Discharge Flow: 0.025 MGD Municipal (Outfall 001)**
**Receiving Stream: Robinson River**
**Latitude / Longitude: 38°20'13" / 78°05'29"(Outfall 001)**
Streamcode: 3-ROB
Waterbody: VAN-E15R/RA36
Water Quality Stds: Class III, Sec. 4
Rivermile: 3.4

1. Is there monitoring data for the receiving stream?

Yes, there is monitoring data for the Robinson River.

- If yes, please attach latest summary.

Outfall 001 discharges into the Robinson River. DEQ monitoring station 3-ROB001.90 is located 1.6 miles downstream of the outfall at the Rt. 614 bridge crossing. The following is the summary for the segment of the Robinson River that this facility discharges to, as taken from the 2010 Integrated Report:

*Class III, Section 4.*

*DEQ ambient monitoring station 3-ROB001.90, at Route 614, and biological monitoring station 3-ROB004.04, off Route 721. DEQ Freshwater Probabilistic Monitoring Station 3-ROB004.98. USGS Station 01665000.*

*E. coli monitoring finds a bacterial impairment, resulting in an impaired classification for the recreation use. A bacteria TMDL for the Robinson River watershed was completed and approved by U.S. EPA. DEQ benthic macroinvertebrate biological and associated chemical monitoring finds the aquatic life and wildlife uses to be fully supporting. The fish consumption is fully supporting based on water column metals data.*

- If no, where is the nearest downstream monitoring station.

2. Is the receiving stream on the current 303(d) list?

Yes, the Robinson River is listed on the current 303(d) list.

**Attachment 5**

- If yes, what is the impairment?

The Robinson River is listed as not meeting the recreation use goal. Sufficient excursions from the maximum *E. coli* bacteria criterion (17 of 58 samples - 32.4%) were recorded at DEQ's ambient water quality monitoring station (3-ROB001.90) at the Route 614 crossing to assess this stream segment as not supporting of the recreation use goal for the 2010 water quality assessment.

- Has the TMDL been prepared?

Yes. A bacteria TMDL for the Robinson River watershed was submitted to the U.S. EPA and approved December 12, 2005. Nonpoint sources of fecal coliform are primarily agricultural (i.e., land-applied animal waste, manure deposited directly on pastures by livestock, and a significant fecal coliform load due to cattle directly depositing manure in streams) with a significant load applied to residential and forest land use categories. Non-agricultural anthropogenic nonpoint sources of fecal coliform loadings include straight pipes, failing septic systems, and pet waste. Wildlife contributes to fecal coliform loadings on all land uses, according to the acceptable habitat range for each species.

- If yes, what is the WLA for the discharge?

This facility received a WLA of 4.35E+10 cfu/year of *E. coli*.

- If no, what is the schedule for the TMDL?

3. If the answer to (2) above is no, is there a downstream 303(d) listed impairment? N/A

   - If yes, what is the impairment? N/A

   - Has a TMDL been prepared? N/A

   - Will the TMDL include the receiving stream? N/A

   - Is there a WLA for the discharge? N/A

   - What is the schedule for the TMDL? N/A

4. Is there monitoring or other conditions that Planning/Assessment needs in the permit?

   1. The Rapidan River, approximately 33 miles downstream of the outfall, is listed with a fish consumption use impairment due to mercury in fish tissue. Excursions above the water quality criterion based fish tissue value (TV) of 300 parts per billion (ppb) for mercury (Hg) in fish tissue were recorded in three species of fish (American eel, rock bass, smallmouth bass) collected at monitoring station 3-RAP006.53 during 2006. A TMDL is scheduled to be completed by 2022.

2. The tidal Rappahannock River, which is located approximately 57 miles downstream of this facility, is listed with a PCB impairment. In support for the PCB TMDL that will be developed for the tidal Rappahannock River by 2016, this facility is a candidate for low-level PCB monitoring, based upon its designation as a minor municipal facility. Low-level PCB analysis uses EPA Method 1668B, which is capable of detecting low-level concentration for all 209 PCB congeners. This Assessment/TMDL Staff has concluded that low-level PCB monitoring is not warranted for this facility, as the discharge is less than 0.1 MGD and there are not any stream segments downstream of the facility that are listed with a PCB impairment. Fish tissue monitoring has been conducted on the Rapidan River and there have been no exceedances of the fish tissue criterion for PCBs. Based upon this information, this facility will not be requested to monitor for low-level PCBs.

3. There is a completed downstream TMDL for the nutrient impairments for the Chesapeake Bay. However, the Bay TMDL and the WLAs contained within the TMDL are not addressed in this planning statement.

5. Could you please calculate the drainage area at the outfall?

   174.5$mi^2$

6. Fact Sheet Requirements – Please provide information on other individual VPDES permits or VA DEQ monitoring stations located within a 2 mile radius of the facility. In addition, please provide information on any drinking water intakes located within a 5 mile radius of the facility.

   There are no public water supply intakes located within a 5 mile radius of the outfall for this facility. There are no other VDPES permits within a 2 mile radius of the outfall; however, there are 4 DEQ water quality monitoring stations, 3-ROB001.90, 3-ROB004.04, 3-ROB004.98, and 3-COO000.04 within the 2 mile radius.

# pH and Temperature Data -- DEQ Monitoring Station 3-ROB001.91
## March 2003 -- February 2011

| Collection Date & Time | Temp (C) | pH (S.U.) |
|---|---|---|
| Mar-03 | 4.3 | 8.72 |
| Apr-03 | 16.42 | 6.94 |
| Jun-03 | 17.86 | 6.88 |
| Jul-03 | 21.29 | 6.83 |
| Sep-03 | 18.76 | 6.69 |
| Nov-03 | 11.06 | 6.87 |
| Jan-04 | 0.29 | 7.1 |
| Mar-04 | 9.32 | 8.16 |
| Jun-04 | 25.3 | 7.89 |
| Jul-04 | 23.47 | 7.17 |
| Aug-04 | 22.55 | 8.46 |
| Sep-04 | 20.69 | 6.33 |
| Oct-04 | 16.26 | 7.33 |
| Nov-04 | 14.1 | 8.33 |
| Dec-04 | 7.41 | 6.89 |
| Jan-05 | 6.57 | 6.85 |
| Feb-05 | 7.51 | 7.56 |
| Mar-05 | 3.65 | 7.53 |
| Apr-05 | 13.12 | 7.59 |
| May-05 | 18.79 | 8.08 |
| Jun-05 | 21.72 | 6.99 |
| Jul-05 | 26.13 | 7.1 |
| Aug-05 | 25.47 | 7.8 |
| Sep-05 | 21.94 | 7.18 |
| Oct-05 | 9.63 | 6.81 |
| Nov-05 | 11.8 | 7.09 |
| Dec-05 | 2.9 | 6.76 |
| Jan-06 | 5.66 | 7.02 |
| Mar-06 | 8.6 | 7.4 |
| Apr-06 | 16.1 | 7.5 |
| May-06 | 16.7 | 6.9 |
| Jun-06 | 20.6 | 7.2 |
| Jul-06 | 24 | 6.9 |
| Aug-06 | 23.9 | 6.9 |
| Sep-06 | 19.3 | 7.3 |
| Oct-06 | 10.8 | 7 |
| Nov-06 | 12.8 | 7 |
| Dec-06 | 6.8 | 6.7 |
| Jan-07 | 5.8 | 6.9 |
| Feb-07 | 2.5 | 7.3 |
| Mar-07 | 9.2 | 7.1 |
| Apr-07 | 11.3 | 7 |
| May-07 | 19.6 | 6.9 |
| Jun-07 | 26.4 | 7.5 |
| Jul-07 | 27 | 7.4 |
| Aug-07 | 23.9 | 7.2 |
| Sep-07 | 17.6 | 7.5 |
| Oct-07 | 16 | 7.2 |
| Nov-07 | 10.6 | 7.2 |
| Dec-07 | 8 | 7.2 |



**Attachment 6**

## pH and Temperature Data -- DEQ Monitoring Station 3-ROB001.91
## March 2003 -- February 2011

| | | |
|---|---|---|
| Jan-08 | 0.8 | 7.1 |
| Feb-08 | 3.5 | 7 |
| Mar-08 | 9.3 | 7 |
| Apr-08 | 11.7 | 7.3 |
| May-08 | 15.3 | 6.9 |
| Jun-08 | 20.4 | 7 |
| Jul-08 | 25.1 | 7.3 |
| Aug-08 | 22.8 | 7.2 |
| Sep-08 | 24.7 | 7.2 |
| Oct-08 | 17.3 | 7.2 |
| Nov-08 | 7.9 | 7.2 |
| Dec-08 | 4.7 | 6.9 |
| Jan-09 | -0.1 | 6.9 |
| Feb-09 | 9 | 6.9 |
| Mar-09 | 9.3 | 7 |
| Apr-09 | 12.1 | 7 |
| May-09 | 15.1 | 7 |
| Jun-09 | 22.7 | 7.1 |
| Jul-09 | 22.8 | 7.2 |
| Aug-09 | 26.9 | 7.3 |
| Sep-09 | 21.9 | 7.2 |
| Oct-09 | 11.2 | 7.1 |
| Nov-09 | 10.1 | 7.2 |
| Dec-09 | 5.3 | 7.2 |
| Jan-10 | 4.8 | 7.1 |
| Mar-10 | 10.4 | 7.2 |
| Apr-10 | 13.2 | 7.3 |
| May-10 | 16.8 | 7.2 |
| Jun-10 | 23.7 | 7.3 |
| Jul-10 | 26.5 | 7.3 |
| Aug-10 | 26.7 | 7.4 |
| Sep-10 | 22.9 | 7.3 |
| Oct-10 | 14.5 | 7.3 |
| Nov-10 | 9 | 7.1 |
| Dec-10 | 0 | 7.1 |
| Jan-11 | 3.2 | 7.2 |
| Feb-11 | 3.5 | 7.2 |
| **90th Percentile** | **25** | **7.5** |
| **10th Percentile** | **3.6** | **6.9** |

**Effluent pH Data from DMRs March 2010 -- Feb 2011**
**Hartland Institute (VA0068951)**

| DMR Date Due | Maxium pH Concentration (S.U.) |
|---|---|
| 10-Mar-11 | **8.0** |
| 10-Feb-11 | **7.8** |
| 10-Jan-11 | **7.7** |
| 10-Dec-10 | **7.6** |
| 10-Nov-10 | **7.8** |
| 10-Oct-10 | **7.5** |
| 10-Sep-10 | **7.8** |
| 10-Aug-10 | **7.7** |
| 10-Jul-10 | **8.0** |
| 10-Jun-10 | **7.7** |
| 10-May-10 | **7.5** |
| 10-Apr-10 | **7.3** |
| **90th Percentile** | **7.9** |

Attachment 7

# FRESHWATER
# WATER QUALITY CRITERIA / WASTELOAD ALLOCATION ANALYSIS

Facility Name: Hartland Institute  Permit No.: VA0068951

Receiving Stream: Robinson River  Version: OWP Guidance Memo 00-2011 (8/24/00)

## Stream Information

| | |
|---|---|
| Mean Hardness (as CaCO3) = | 50 mg/L |
| 90% Temperature (Annual) = | 25 deg C |
| 90% Temperature (Wet season) = | 15 deg C |
| 90% Maximum pH = | 7.5 SU |
| 10% Maximum pH = | 6.9 SU |
| Tier Designation (1 or 2) = | 2 |
| Public Water Supply (PWS) Y/N? = | n |
| Trout Present Y/N? = | n |
| Early Life Stages Present Y/N? = | y |

## Stream Flows

| | |
|---|---|
| 1Q10 (Annual) = | 4 MGD |
| 7Q10 (Annual) = | 5.6 MGD |
| 30Q10 (Annual) = | 9.4 MGD |
| 1Q10 (Wet season) = | 25 MGD |
| 30Q10 (Wet season) | 38 MGD |
| 30Q5 = | 13 MGD |
| Harmonic Mean = | 50 MGD |

## Mixing Information

| | |
|---|---|
| Annual - 1Q10 Mix = | 21.51 % |
| - 7Q10 Mix = | 100 % |
| - 30Q10 Mix = | 100 % |
| Wet Season - 1Q10 Mix = | 100 % |
| - 30Q10 Mix = | 100 % |

## Effluent Information

| | |
|---|---|
| Mean Hardness (as CaCO3) = | 50 mg/L |
| 90% Temp (Annual) = | 25 deg C |
| 90% Temp (Wet season) = | 15 deg C |
| 90% Maximum pH = | 7.9 SU |
| 10% Maximum pH = | SU |
| Discharge Flow = | 0.025 MGD |

| Parameter | Background | Water Quality Criteria | | | | Wasteload Allocations | | | | Antidegradation Baseline | | | | Antidegradation Allocations | | | | **Most Limiting Allocations** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (ug/l unless noted) | Conc. | Acute | Chronic | HH (PWS) | HH | Acute | Chronic | HH (PWS) | HH | Acute | Chronic | HH (PWS) | HH | Acute | Chronic | HH (PWS) | HH | **Acute** | **Chronic** | **HH (PWS)** | **HH** |
| Acenapthene | 0 | -- | -- | na | 9.9E+02 | -- | -- | na | 5.2E+05 | -- | -- | na | 9.9E+01 | -- | -- | na | 5.2E+04 | -- | -- | **na** | **5.2E+04** |
| Acrolein | 0 | -- | -- | na | 9.3E+00 | -- | -- | na | 4.8E+03 | -- | -- | na | 9.3E-01 | -- | -- | na | 4.8E+02 | -- | -- | **na** | **4.8E+02** |
| Acrylonitrile [C] | 0 | -- | -- | na | 2.5E+00 | -- | -- | na | 5.0E+03 | -- | -- | na | 2.5E-01 | -- | -- | na | 5.0E+02 | -- | -- | **na** | **5.0E+02** |
| Aldrin [C] | 0 | 3.0E+00 | -- | na | 5.0E-04 | 1.1E+02 | -- | na | 1.0E+00 | 7.5E-01 | -- | na | 5.0E-05 | 1.2E+02 | -- | na | 1.0E-01 | **1.1E+02** | -- | **na** | **1.0E-01** |
| Ammonia-N (mg/l) (Yearly) | 0 | 1.97E+01 | 2.22E+00 | na | -- | 7.0E+02 | 8.4E+02 | na | -- | 4.96E+00 | 5.55E-01 | na | -- | 8.0E+02 | 2.1E+02 | na | -- | **7.0E+02** | **2.1E+02** | **na** | -- |
| Ammonia-N (mg/l) (High Flow) | 0 | 1.99E+01 | 4.23E+00 | na | -- | 2.0E+04 | 6.4E+03 | na | -- | 4.97E+00 | 1.06E+00 | na | -- | 5.0E+03 | 1.6E+03 | na | -- | **5.0E+03** | **1.6E+03** | **na** | -- |
| Anthracene | 0 | -- | -- | na | 4.0E+04 | -- | -- | na | 2.1E+07 | -- | -- | na | 4.0E+03 | -- | -- | na | 2.1E+06 | -- | -- | **na** | **2.1E+06** |
| Antimony | 0 | -- | -- | na | 6.4E+02 | -- | -- | na | 3.3E+05 | -- | -- | na | 6.4E+01 | -- | -- | na | 3.3E+04 | -- | -- | **na** | **3.3E+04** |
| Arsenic | 0 | 3.4E+02 | 1.5E+02 | na | -- | 1.2E+04 | 3.4E+04 | na | -- | 8.5E+01 | 3.8E+01 | na | -- | 1.4E+04 | 8.4E+03 | na | -- | **1.2E+04** | **8.4E+03** | **na** | -- |
| Barium | 0 | -- | -- | na | -- | -- | -- | na | -- | -- | -- | na | -- | -- | -- | na | -- | -- | -- | **na** | -- |
| Benzene [C] | 0 | -- | -- | na | 5.1E+02 | -- | -- | na | 1.0E+06 | -- | -- | na | 5.1E+01 | -- | -- | na | 1.0E+05 | -- | -- | **na** | **1.0E+05** |
| Benzidine [C] | 0 | -- | -- | na | 2.0E-03 | -- | -- | na | 4.0E+00 | -- | -- | na | 2.0E-04 | -- | -- | na | 4.0E-01 | -- | -- | **na** | **4.0E-01** |
| Benzo (a) anthracene [C] | 0 | -- | -- | na | 1.8E-01 | -- | -- | na | 3.6E+02 | -- | -- | na | 1.8E-02 | -- | -- | na | 3.6E+01 | -- | -- | **na** | **3.6E+01** |
| Benzo (b) fluoranthene [C] | 0 | -- | -- | na | 1.8E-01 | -- | -- | na | 3.6E+02 | -- | -- | na | 1.8E-02 | -- | -- | na | 3.6E+01 | -- | -- | **na** | **3.6E+01** |
| Benzo (k) fluoranthene [C] | 0 | -- | -- | na | 1.8E-01 | -- | -- | na | 3.6E+02 | -- | -- | na | 1.8E-02 | -- | -- | na | 3.6E+01 | -- | -- | **na** | **3.6E+01** |
| Benzo (a) pyrene [C] | 0 | -- | -- | na | 1.8E-01 | -- | -- | na | 3.6E+02 | -- | -- | na | 1.8E-02 | -- | -- | na | 3.6E+01 | -- | -- | **na** | **3.6E+01** |
| Bis2-Chloroethyl Ether [C] | 0 | -- | -- | na | 5.3E+00 | -- | -- | na | 1.1E+04 | -- | -- | na | 5.3E-01 | -- | -- | na | 1.1E+03 | -- | -- | **na** | **1.1E+03** |
| Bis2-Chloroisopropyl Ether | 0 | -- | -- | na | 6.5E+04 | -- | -- | na | 3.4E+07 | -- | -- | na | 6.5E+03 | -- | -- | na | 3.4E+06 | -- | -- | **na** | **3.4E+06** |
| Bis 2-Ethylhexyl Phthalate [C] | 0 | -- | -- | na | 2.2E+01 | -- | -- | na | 4.4E+04 | -- | -- | na | 2.2E+00 | -- | -- | na | 4.4E+03 | -- | -- | **na** | **4.4E+03** |
| Bromoform [C] | 0 | -- | -- | na | 1.4E+03 | -- | -- | na | 2.8E+06 | -- | -- | na | 1.4E+02 | -- | -- | na | 2.8E+05 | -- | -- | **na** | **2.8E+05** |
| Butylbenzylphthalate | 0 | -- | -- | na | 1.9E+03 | -- | -- | na | 9.9E+05 | -- | -- | na | 1.9E+02 | -- | -- | na | 9.9E+04 | -- | -- | **na** | **9.9E+04** |
| Cadmium | 0 | 1.8E+00 | 6.6E-01 | na | -- | 6.4E+01 | 1.5E+02 | na | -- | 4.5E-01 | 1.6E-01 | na | -- | 7.2E+01 | 3.7E+01 | na | -- | **6.4E+01** | **3.7E+01** | **na** | -- |
| Carbon Tetrachloride [C] | 0 | -- | -- | na | 1.6E+01 | -- | -- | na | 3.2E+04 | -- | -- | na | 1.6E+00 | -- | -- | na | 3.2E+03 | -- | -- | **na** | **3.2E+03** |
| Chlordane [C] | 0 | 2.4E+00 | 4.3E-03 | na | 8.1E-03 | 8.5E+01 | 9.7E-01 | na | 1.6E+01 | 6.0E-01 | 1.1E-03 | na | 8.1E-04 | 9.7E+01 | 2.4E-01 | na | 1.6E+00 | **8.5E+01** | **2.4E-01** | **na** | **1.6E+00** |
| Chloride | 0 | 8.6E+05 | 2.3E+05 | na | - | 3.0E+07 | 5.2E+07 | na | -- | 2.2E+05 | 5.8E+04 | na | -- | 3.5E+07 | 1.3E+07 | na | -- | **3.0E+07** | **1.3E+07** | **na** | -- |

| Parameter | Background | Water Quality Criteria | | | | Wasteload Allocations | | | | Antidegradation Baseline | | | | Antidegradation Allocations | | | | **Most Limiting Allocations** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (ug/l unless noted) | Conc. | Acute | Chronic | HH (PWS) | HH | Acute | Chronic | HH (PWS) | HH | Acute | Chronic | HH (PWS) | HH | Acute | Chronic | HH (PWS) | HH | **Acute** | **Chronic** | **HH (PWS)** | **HH** |
| TRC | 0 | 1.9E+01 | 1.1E+01 | na | -- | 6.7E+02 | 2.5E+03 | na | -- | 4.8E+00 | 2.8E+00 | na | -- | 7.6E+02 | 6.2E+02 | na | -- | **6.7E+02** | **6.2E+02** | **na** | **--** |
| Chlorobenzene | 0 | -- | -- | na | 1.6E+03 | -- | -- | na | 8.3E+05 | -- | -- | na | 1.6E+02 | -- | -- | na | 8.3E+04 | **--** | **--** | **na** | **8.3E+04** |

| Parameter | Background | Water Quality Criteria | | | | Wasteload Allocations | | | | Antidegradation Baseline | | | | Antidegradation Allocations | | | | **Most Limiting Allocations** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (ug/l unless noted) | Conc. | Acute | Chronic | HH (PWS) | HH | Acute | Chronic | HH (PWS) | HH | Acute | Chronic | HH (PWS) | HH | Acute | Chronic | HH (PWS) | HH | **Acute** | **Chronic** | **HH (PWS)** | **HH** |
| Chlorodibromomethane[C] | 0 | -- | -- | na | 1.3E+02 | -- | -- | na | 2.6E+05 | -- | -- | na | 1.3E+01 | -- | -- | na | 2.6E+04 | -- | -- | **na** | **2.6E+04** |
| Chloroform | 0 | -- | -- | na | 1.1E+04 | -- | -- | na | 5.7E+06 | -- | -- | na | 1.1E+03 | -- | -- | na | 5.7E+05 | -- | -- | **na** | **5.7E+05** |
| 2-Chloronaphthalene | 0 | -- | -- | na | 1.6E+03 | -- | -- | na | 8.3E+05 | -- | -- | na | 1.6E+02 | -- | -- | na | 8.3E+04 | -- | -- | **na** | **8.3E+04** |
| 2-Chlorophenol | 0 | -- | -- | na | 1.5E+02 | -- | -- | na | 7.8E+04 | -- | -- | na | 1.5E+01 | -- | -- | na | 7.8E+03 | -- | -- | **na** | **7.8E+03** |
| Chlorpyrifos | 0 | 8.3E-02 | 4.1E-02 | na | -- | 2.9E+00 | 9.2E+00 | na | -- | 2.1E-02 | 1.0E-02 | na | -- | 3.3E+00 | 2.3E+00 | na | -- | **2.9E+00** | **2.3E+00** | **na** | -- |
| Chromium III | 0 | 3.2E+02 | 4.2E+01 | na | -- | 1.1E+04 | 9.5E+03 | na | -- | 8.1E+01 | 1.1E+01 | na | -- | 1.3E+04 | 2.4E+03 | na | -- | **1.1E+04** | **2.4E+03** | **na** | -- |
| Chromium VI | 0 | 1.6E+01 | 1.1E+01 | na | -- | 5.7E+02 | 2.5E+03 | na | -- | 4.0E+00 | 2.8E+00 | na | -- | 6.4E+02 | 6.2E+02 | na | -- | **5.7E+02** | **6.2E+02** | **na** | -- |
| Chromium, Total | 0 | -- | -- | 1.0E+02 | -- | -- | -- | na | -- | -- | -- | 1.0E+01 | -- | -- | -- | 5.2E+03 | -- | -- | -- | **na** | -- |
| Chrysene[C] | 0 | -- | -- | na | 1.8E-02 | -- | -- | na | 3.6E+01 | -- | -- | na | 1.8E-03 | -- | -- | na | 3.6E+00 | -- | -- | **na** | **3.6E+00** |
| Copper | 0 | 7.0E+00 | 5.0E+00 | na | -- | 2.5E+02 | 1.1E+03 | na | -- | 1.7E+00 | 1.2E+00 | na | -- | 2.8E+02 | 2.8E+02 | na | -- | **2.5E+02** | **2.8E+02** | **na** | -- |
| Cyanide, Free | 0 | 2.2E+01 | 5.2E+00 | na | 1.6E+04 | 7.8E+02 | 1.2E+03 | na | 8.3E+06 | 5.5E+00 | 1.3E+00 | na | 1.6E+03 | 8.9E+02 | 2.9E+02 | na | 8.3E+05 | **7.8E+02** | **2.9E+02** | **na** | **8.3E+05** |
| DDD[C] | 0 | -- | -- | na | 3.1E-03 | -- | -- | na | 6.2E+00 | -- | -- | na | 3.1E-04 | -- | -- | na | 6.2E-01 | -- | -- | **na** | **6.2E-01** |
| DDE[C] | 0 | -- | -- | na | 2.2E-03 | -- | -- | na | 4.4E+00 | -- | -- | na | 2.2E-04 | -- | -- | na | 4.4E-01 | -- | -- | **na** | **4.4E-01** |
| DDT[C] | 0 | 1.1E+00 | 1.0E-03 | na | 2.2E-03 | 3.9E+01 | 2.3E-01 | na | 4.4E+00 | 2.8E-01 | 2.5E-04 | na | 2.2E-04 | 4.4E+01 | 5.6E-02 | na | 4.4E-01 | **3.9E+01** | **5.6E-02** | **na** | **4.4E-01** |
| Demeton | 0 | -- | 1.0E-01 | na | -- | -- | 2.3E+01 | na | -- | -- | 2.5E-02 | na | -- | -- | 5.6E+00 | na | -- | -- | **5.6E+00** | **na** | -- |
| Diazinon | 0 | 1.7E-01 | 1.7E-01 | na | -- | 6.0E+00 | 3.8E+01 | na | -- | 4.3E-02 | 4.3E-02 | na | -- | 6.8E+00 | 9.6E+00 | na | -- | **6.0E+00** | **9.6E+00** | **na** | -- |
| Dibenz(a,h)anthracene[C] | 0 | -- | -- | na | 1.8E-01 | -- | -- | na | 3.6E+02 | -- | -- | na | 1.8E-02 | -- | -- | na | 3.6E+01 | -- | -- | **na** | **3.6E+01** |
| 1,2-Dichlorobenzene | 0 | -- | -- | na | 1.3E+03 | -- | -- | na | 6.8E+05 | -- | -- | na | 1.3E+02 | -- | -- | na | 6.8E+04 | -- | -- | **na** | **6.8E+04** |
| 1,3-Dichlorobenzene | 0 | -- | -- | na | 9.6E+02 | -- | -- | na | 5.0E+05 | -- | -- | na | 9.6E+01 | -- | -- | na | 5.0E+04 | -- | -- | **na** | **5.0E+04** |
| 1,4-Dichlorobenzene | 0 | -- | -- | na | 1.9E+02 | -- | -- | na | 9.9E+04 | -- | -- | na | 1.9E+01 | -- | -- | na | 9.9E+03 | -- | -- | **na** | **9.9E+03** |
| 3,3-Dichlorobenzidine[C] | 0 | -- | -- | na | 2.8E-01 | -- | -- | na | 5.6E+02 | -- | -- | na | 2.8E-02 | -- | -- | na | 5.6E+01 | -- | -- | **na** | **5.6E+01** |
| Dichlorobromomethane[C] | 0 | -- | -- | na | 1.7E+02 | -- | -- | na | 3.4E+05 | -- | -- | na | 1.7E+01 | -- | -- | na | 3.4E+04 | -- | -- | **na** | **3.4E+04** |
| 1,2-Dichloroethane[C] | 0 | -- | -- | na | 3.7E+02 | -- | -- | na | 7.4E+05 | -- | -- | na | 3.7E+01 | -- | -- | na | 7.4E+04 | -- | -- | **na** | **7.4E+04** |
| 1,1-Dichloroethylene | 0 | -- | -- | na | 7.1E+03 | -- | -- | na | 3.7E+06 | -- | -- | na | 7.1E+02 | -- | -- | na | 3.7E+05 | -- | -- | **na** | **3.7E+05** |
| 1,2-trans-dichloroethylene | 0 | -- | -- | na | 1.0E+04 | -- | -- | na | 5.2E+06 | -- | -- | na | 1.0E+03 | -- | -- | na | 5.2E+05 | -- | -- | **na** | **5.2E+05** |
| 2,4-Dichlorophenol | 0 | -- | -- | na | 2.9E+02 | -- | -- | na | 1.5E+05 | -- | -- | na | 2.9E+01 | -- | -- | na | 1.5E+04 | -- | -- | **na** | **1.5E+04** |
| 2,4-Dichlorophenoxy acetic acid (2,4-D) | 0 | -- | -- | na | -- | -- | -- | na | -- | -- | -- | na | -- | -- | -- | na | -- | -- | -- | **na** | -- |
| 1,2-Dichloropropane[C] | 0 | -- | -- | na | 1.5E+02 | -- | -- | na | 3.0E+05 | -- | -- | na | 1.5E+01 | -- | -- | na | 3.0E+04 | -- | -- | **na** | **3.0E+04** |
| 1,3-Dichloropropene[C] | 0 | -- | -- | na | 2.1E+02 | -- | -- | na | 4.2E+05 | -- | -- | na | 2.1E+01 | -- | -- | na | 4.2E+04 | -- | -- | **na** | **4.2E+04** |
| Dieldrin[C] | 0 | 2.4E-01 | 5.6E-02 | na | 5.4E-04 | 8.5E+00 | 1.3E+01 | na | 1.1E+00 | 6.0E-02 | 1.4E-02 | na | 5.4E-05 | 9.7E+00 | 3.2E+00 | na | 1.1E-01 | **8.5E+00** | **3.2E+00** | **na** | **1.1E-01** |
| Diethyl Phthalate | 0 | -- | -- | na | 4.4E+04 | -- | -- | na | 2.3E+07 | -- | -- | na | 4.4E+03 | -- | -- | na | 2.3E+06 | -- | -- | **na** | **2.3E+06** |
| 2,4-Dimethylphenol | 0 | -- | -- | na | 8.5E+02 | -- | -- | na | 4.4E+05 | -- | -- | na | 8.5E+01 | -- | -- | na | 4.4E+04 | -- | -- | **na** | **4.4E+04** |
| Dimethyl Phthalate | 0 | -- | -- | na | 1.1E+06 | -- | -- | na | 5.7E+08 | -- | -- | na | 1.1E+05 | -- | -- | na | 5.7E+07 | -- | -- | **na** | **5.7E+07** |
| Di-n-Butyl Phthalate | 0 | -- | -- | na | 4.5E+03 | -- | -- | na | 2.3E+06 | -- | -- | na | 4.5E+02 | -- | -- | na | 2.3E+05 | -- | -- | **na** | **2.3E+05** |
| 2,4 Dinitrophenol | 0 | -- | -- | na | 5.3E+03 | -- | -- | na | 2.8E+06 | -- | -- | na | 5.3E+02 | -- | -- | na | 2.8E+05 | -- | -- | **na** | **2.8E+05** |
| 2-Methyl-4,6-Dinitrophenol | 0 | -- | -- | na | 2.8E+02 | -- | -- | na | 1.5E+05 | -- | -- | na | 2.8E+01 | -- | -- | na | 1.5E+04 | -- | -- | **na** | **1.5E+04** |
| 2,4-Dinitrotoluene[C] | 0 | -- | -- | na | 3.4E+01 | -- | -- | na | 6.8E+04 | -- | -- | na | 3.4E+00 | -- | -- | na | 6.8E+03 | -- | -- | **na** | **6.8E+03** |
| Dioxin 2,3,7,8-tetrachlorodibenzo-p-dioxin | 0 | -- | -- | na | 5.1E-08 | -- | -- | na | 2.7E-05 | -- | -- | na | 5.1E-09 | -- | -- | na | 2.7E-06 | -- | -- | **na** | **2.7E-06** |
| 1,2-Diphenylhydrazine[C] | 0 | -- | -- | na | 2.0E+00 | -- | -- | na | 4.0E+03 | -- | -- | na | 2.0E-01 | -- | -- | na | 4.0E+02 | -- | -- | **na** | **4.0E+02** |
| Alpha-Endosulfan | 0 | 2.2E-01 | 5.6E-02 | na | 8.9E+01 | 7.8E+00 | 1.3E+01 | na | 4.6E+04 | 5.5E-02 | 1.4E-02 | na | 8.9E+00 | 8.9E+00 | 3.2E+00 | na | 4.6E+03 | **7.8E+00** | **3.2E+00** | **na** | **4.6E+03** |
| Beta-Endosulfan | 0 | 2.2E-01 | 5.6E-02 | na | 8.9E+01 | 7.8E+00 | 1.3E+01 | na | 4.6E+04 | 5.5E-02 | 1.4E-02 | na | 8.9E+00 | 8.9E+00 | 3.2E+00 | na | 4.6E+03 | **7.8E+00** | **3.2E+00** | **na** | **4.6E+03** |
| Alpha + Beta Endosulfan | 0 | 2.2E-01 | 5.6E-02 | -- | -- | 7.8E+00 | 1.3E+01 | -- | -- | 5.5E-02 | 1.4E-02 | -- | -- | 8.9E+00 | 3.2E+00 | -- | -- | **7.8E+00** | **3.2E+00** | -- | -- |
| Endosulfan Sulfate | 0 | -- | -- | na | 8.9E+01 | -- | -- | na | 4.6E+04 | -- | -- | na | 8.9E+00 | -- | -- | na | 4.6E+03 | -- | -- | **na** | **4.6E+03** |
| Endrin | 0 | 8.6E-02 | 3.6E-02 | na | 6.0E-02 | 3.0E+00 | 8.1E+00 | na | 3.1E+01 | 2.2E-02 | 9.0E-03 | na | 6.0E-03 | 3.5E+00 | 2.0E+00 | na | 3.1E+00 | **3.0E+00** | **2.0E+00** | **na** | **3.1E+00** |

| Parameter | Background | Water Quality Criteria | | | | Wasteload Allocations | | | | Antidegradation Baseline | | | | Antidegradation Allocations | | | | **Most Limiting Allocations** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (ug/l unless noted) | Conc. | Acute | Chronic | HH (PWS) | HH | Acute | Chronic | HH (PWS) | HH | Acute | Chronic | HH (PWS) | HH | Acute | Chronic | HH (PWS) | HH | **Acute** | **Chronic** | **HH (PWS)** | **HH** |
| Endrin Aldehyde | 0 | -- | -- | na | 3.0E-01 | -- | -- | na | 1.6E+02 | -- | -- | na | 3.0E-02 | -- | -- | na | 1.6E+01 | -- | -- | **na** | **1.6E+01** |

| Parameter | Background | Water Quality Criteria | | | | Wasteload Allocations | | | | Antidegradation Baseline | | | | Antidegradation Allocations | | | | Most Limiting Allocations | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (ug/l unless noted) | Conc. | Acute | Chronic | HH (PWS) | HH | Acute | Chronic | HH (PWS) | HH | Acute | Chronic | HH (PWS) | HH | Acute | Chronic | HH (PWS) | HH | Acute | Chronic | HH (PWS) | HH |
| Ethylbenzene | 0 | -- | -- | na | 2.1E+03 | -- | -- | na | 1.1E+06 | -- | -- | na | 2.1E+02 | -- | -- | na | 1.1E+05 | -- | -- | na | **1.1E+05** |
| Fluoranthene | 0 | -- | -- | na | 1.4E+02 | -- | -- | na | 7.3E+04 | -- | -- | na | 1.4E+01 | -- | -- | na | 7.3E+03 | -- | -- | na | **7.3E+03** |
| Fluorene | 0 | -- | -- | na | 5.3E+03 | -- | -- | na | 2.8E+06 | -- | -- | na | 5.3E+02 | -- | -- | na | 2.8E+05 | -- | -- | **na** | **2.8E+05** |
| Foaming Agents | 0 | -- | -- | na | -- | -- | -- | na | -- | -- | -- | na | -- | -- | -- | na | -- | -- | -- | **na** | **--** |
| Guthion | 0 | -- | 1.0E-02 | na | -- | -- | 2.3E+00 | na | -- | -- | 2.5E-03 | na | -- | -- | 5.6E-01 | na | -- | -- | **5.6E-01** | **na** | **--** |
| Heptachlor [C] | 0 | 5.2E-01 | 3.8E-03 | na | 7.9E-04 | 1.8E+01 | 8.6E-01 | na | 1.6E+00 | 1.3E-01 | 9.5E-04 | na | 7.9E-05 | 2.1E+01 | 2.1E-01 | na | 1.6E-01 | **1.8E+01** | **2.1E-01** | **na** | **1.6E-01** |
| Heptachlor Epoxide [C] | 0 | 5.2E-01 | 3.8E-03 | na | 3.9E-04 | 1.8E+01 | 8.6E-01 | na | 7.8E-01 | 1.3E-01 | 9.5E-04 | na | 3.9E-05 | 2.1E+01 | 2.1E-01 | na | 7.8E-02 | **1.8E+01** | **2.1E-01** | **na** | **7.8E-02** |
| Hexachlorobenzene [C] | 0 | -- | -- | na | 2.9E-03 | -- | -- | na | 5.8E+00 | -- | -- | na | 2.9E-04 | -- | -- | na | 5.8E-01 | -- | -- | na | **5.8E-01** |
| Hexachlorobutadiene [C] | 0 | -- | -- | na | 1.8E+02 | -- | -- | na | 3.6E+05 | -- | -- | na | 1.8E+01 | -- | -- | na | 3.6E+04 | -- | -- | **na** | **3.6E+04** |
| Hexachlorocyclohexane Alpha-BHC [C] | 0 | -- | -- | na | 4.9E-02 | -- | -- | na | 9.8E+01 | -- | -- | na | 4.9E-03 | -- | -- | na | 9.8E+00 | -- | -- | **na** | **9.8E+00** |
| Hexachlorocyclohexane Beta-BHC [C] | 0 | -- | -- | na | 1.7E-01 | -- | -- | na | 3.4E+02 | -- | -- | na | 1.7E-02 | -- | -- | na | 3.4E+01 | -- | -- | **na** | **3.4E+01** |
| Hexachlorocyclohexane Gamma-BHC [C] (Lindane) | 0 | 9.5E-01 | na | na | 1.8E+00 | 3.4E+01 | -- | na | 3.6E+03 | 2.4E-01 | -- | na | 1.8E-01 | 3.8E+01 | -- | na | 3.6E+02 | **3.4E+01** | -- | **na** | **3.6E+02** |
| Hexachlorocyclopentadiene | 0 | -- | -- | na | 1.1E+03 | -- | -- | na | 5.7E+05 | -- | -- | na | 1.1E+02 | -- | -- | na | 5.7E+04 | -- | -- | na | **5.7E+04** |
| Hexachloroethane [C] | 0 | -- | -- | na | 3.3E+01 | -- | -- | na | 6.6E+04 | -- | -- | na | 3.3E+00 | -- | -- | na | 6.6E+03 | -- | -- | **na** | **6.6E+03** |
| Hydrogen Sulfide | 0 | -- | 2.0E+00 | na | -- | -- | 4.5E+02 | na | -- | -- | 5.0E-01 | na | -- | -- | 1.1E+02 | na | -- | -- | **1.1E+02** | na | **--** |
| Indeno (1,2,3-cd) pyrene [C] | 0 | -- | -- | na | 1.8E-01 | -- | -- | na | 3.6E+02 | -- | -- | na | 1.8E-02 | -- | -- | na | 3.6E+01 | -- | -- | na | **3.6E+01** |
| Iron | 0 | -- | -- | na | -- | -- | -- | na | -- | -- | -- | na | -- | -- | -- | na | -- | -- | -- | **na** | **--** |
| Isophorone [C] | 0 | -- | -- | na | 9.6E+03 | -- | -- | na | 1.9E+07 | -- | -- | na | 9.6E+02 | -- | -- | na | 1.9E+06 | -- | -- | **na** | **1.9E+06** |
| Kepone | 0 | -- | 0.0E+00 | na | -- | -- | 0.0E+00 | na | -- | -- | 0.0E+00 | na | -- | -- | 0.0E+00 | na | -- | -- | **0.0E+00** | na | **--** |
| Lead | 0 | 4.9E+01 | 5.6E+00 | na | -- | 1.7E+03 | 1.3E+03 | na | -- | 1.2E+01 | 1.4E+00 | na | -- | 2.0E+03 | 3.1E+02 | na | -- | **1.7E+03** | **3.1E+02** | **na** | **--** |
| Malathion | 0 | -- | 1.0E-01 | na | -- | -- | 2.3E+01 | na | -- | -- | 2.5E-02 | na | -- | -- | 5.6E+00 | na | -- | -- | **5.6E+00** | na | **--** |
| Manganese | 0 | -- | -- | na | -- | -- | -- | na | -- | -- | -- | na | -- | -- | -- | na | -- | -- | -- | **na** | **--** |
| Mercury | 0 | 1.4E+00 | 7.7E-01 | -- | -- | 5.0E+01 | 1.7E+02 | -- | -- | 3.5E-01 | 1.9E-01 | -- | -- | 5.6E+01 | 4.3E+01 | -- | -- | **5.0E+01** | **4.3E+01** | -- | -- |
| Methyl Bromide | 0 | -- | -- | na | 1.5E+03 | -- | -- | na | 7.8E+05 | -- | -- | na | 1.5E+02 | -- | -- | na | 7.8E+04 | -- | -- | na | **7.8E+04** |
| Methylene Chloride [C] | 0 | -- | -- | na | 5.9E+03 | -- | -- | na | 1.2E+07 | -- | -- | na | 5.9E+02 | -- | -- | na | 1.2E+06 | -- | -- | **na** | **1.2E+06** |
| Methoxychlor | 0 | -- | 3.0E-02 | na | -- | -- | 6.8E+00 | na | -- | -- | 7.5E-03 | na | -- | -- | 1.7E+00 | na | -- | -- | **1.7E+00** | **na** | **--** |
| Mirex | 0 | -- | 0.0E+00 | na | -- | -- | 0.0E+00 | na | -- | -- | 0.0E+00 | na | -- | -- | 0.0E+00 | na | -- | -- | **0.0E+00** | **na** | **--** |
| Nickel | 0 | 1.0E+02 | 1.1E+01 | na | 4.6E+03 | 3.6E+03 | 2.5E+03 | na | 2.4E+06 | 2.5E+01 | 2.8E+00 | na | 4.6E+02 | 4.1E+03 | 6.3E+02 | na | 2.4E+05 | **3.6E+03** | **6.3E+02** | **na** | **2.4E+05** |
| Nitrate (as N) | 0 | -- | -- | na | -- | -- | -- | na | -- | -- | -- | na | -- | -- | -- | na | -- | -- | -- | na | **--** |
| Nitrobenzene | 0 | -- | -- | na | 6.9E+02 | -- | -- | na | 3.6E+05 | -- | -- | na | 6.9E+01 | -- | -- | na | 3.6E+04 | -- | -- | **na** | **3.6E+04** |
| N-Nitrosodimethylamine [C] | 0 | -- | -- | na | 3.0E+01 | -- | -- | na | 6.0E+04 | -- | -- | na | 3.0E+00 | -- | -- | na | 6.0E+03 | -- | -- | **na** | **6.0E+03** |
| N-Nitrosodiphenylamine [C] | 0 | -- | -- | na | 6.0E+01 | -- | -- | na | 1.2E+05 | -- | -- | na | 6.0E+00 | -- | -- | na | 1.2E+04 | -- | -- | na | **1.2E+04** |
| N-Nitrosodi-n-propylamine [C] | 0 | -- | -- | na | 5.1E+00 | -- | -- | na | 1.0E+04 | -- | -- | na | 5.1E-01 | -- | -- | na | 1.0E+03 | -- | -- | na | **1.0E+03** |
| Nonylphenol | 0 | 2.8E+01 | 6.6E+00 | -- | -- | 9.9E+02 | 1.5E+03 | na | -- | 7.0E+00 | 1.7E+00 | -- | -- | 1.1E+03 | 3.7E+02 | -- | -- | **9.9E+02** | **3.7E+02** | **na** | **--** |
| Parathion | 0 | 6.5E-02 | 1.3E-02 | na | -- | 2.3E+00 | 2.9E+00 | na | -- | 1.6E-02 | 3.3E-03 | na | -- | 2.6E+00 | 7.3E-01 | na | -- | **2.3E+00** | **7.3E-01** | **na** | **--** |
| PCB Total [C] | 0 | -- | 1.4E-02 | na | 6.4E-04 | -- | 3.2E+00 | na | 1.3E+00 | -- | 3.5E-03 | na | 6.4E-05 | -- | 7.9E-01 | na | 1.3E-01 | -- | **7.9E-01** | **na** | **1.3E-01** |
| Pentachlorophenol [C] | 0 | 3.6E-02 | 6.3E-02 | na | 3.0E+01 | 1.3E+00 | 1.4E+01 | na | 6.0E+04 | 1.8E-02 | 1.6E-02 | na | 3.0E+00 | 2.8E+00 | 3.5E+00 | na | 6.0E+03 | **1.3E+00** | **3.5E+00** | **na** | **6.0E+03** |
| Phenol | 0 | -- | -- | na | 8.6E+05 | -- | -- | na | 4.5E+08 | -- | -- | na | 8.6E+04 | -- | -- | na | 4.5E+07 | -- | -- | **na** | **4.5E+07** |
| Pyrene | 0 | -- | -- | na | 4.0E+03 | -- | -- | na | 2.1E+06 | -- | -- | na | 4.0E+02 | -- | -- | na | 2.1E+05 | -- | -- | **na** | **2.1E+05** |
| Radionuclides | 0 | -- | -- | na | -- | -- | -- | na | -- | -- | -- | na | -- | -- | -- | na | -- | -- | -- | **na** | **--** |
| Gross Alpha Activity (pCi/L) | 0 | -- | -- | na | -- | -- | -- | na | -- | -- | -- | na | -- | -- | -- | na | -- | -- | -- | **na** | **--** |
| Beta and Photon Activity (mrem/yr) | 0 | -- | -- | na | 4.0E+00 | -- | -- | na | 2.1E+03 | -- | -- | na | 4.0E-01 | -- | -- | na | 2.1E+02 | -- | -- | **na** | **2.1E+02** |

| Parameter | Background | Water Quality Criteria | | | | Wasteload Allocations | | | | Antidegradation Baseline | | | | Antidegradation Allocations | | | | **Most Limiting Allocations** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (ug/l unless noted) | Conc. | Acute | Chronic | HH (PWS) | HH | Acute | Chronic | HH (PWS) | HH | Acute | Chronic | HH (PWS) | HH | Acute | Chronic | HH (PWS) | HH | **Acute** | **Chronic** | **HH (PWS)** | **HH** |
| Radium 226 + 228 (pCi/L) | 0 | -- | -- | na | -- | -- | -- | na | -- | -- | -- | na | -- | -- | -- | na | -- | **--** | **--** | **na** | **--** |
| Uranium (ug/l) | 0 | -- | -- | na | -- | -- | -- | na | -- | -- | -- | na | -- | -- | -- | na | -- | **--** | **--** | **na** | **--** |

| Parameter | Background | Water Quality Criteria | | | | Wasteload Allocations | | | | Antidegradation Baseline | | | | Antidegradation Allocations | | | | **Most Limiting Allocations** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (ug/l unless noted) | Conc. | Acute | Chronic | HH (PWS) | HH | Acute | Chronic | HH (PWS) | HH | Acute | Chronic | HH (PWS) | HH | Acute | Chronic | HH (PWS) | HH | **Acute** | **Chronic** | **HH (PWS)** | **HH** |
| Selenium, Total Recoverable | 0 | 2.0E+01 | 5.0E+00 | na | 4.2E+03 | 7.1E+02 | 1.1E+03 | na | 2.2E+06 | 5.0E+00 | 1.3E+00 | na | 4.2E+02 | 8.1E+02 | 2.8E+02 | na | 2.2E+05 | **7.1E+02** | **2.8E+02** | **na** | **2.2E+05** |
| Silver | 0 | 1.0E+00 | -- | na | -- | 3.7E+01 | -- | na | -- | 2.6E-01 | -- | na | -- | 4.2E+01 | -- | na | -- | **3.7E+01** | **--** | **na** | **--** |
| Sulfate | 0 | -- | -- | na | -- | -- | -- | na | -- | -- | -- | na | -- | -- | -- | na | -- | **--** | **--** | **na** | **--** |
| 1,1,2,2-Tetrachloroethane[C] | 0 | -- | -- | na | 4.0E+01 | -- | -- | na | 8.0E+04 | -- | -- | na | 4.0E+00 | -- | -- | na | 8.0E+03 | **--** | **--** | **na** | **8.0E+03** |
| Tetrachloroethylene[C] | 0 | -- | -- | na | 3.3E+01 | -- | -- | na | 6.6E+04 | -- | -- | na | 3.3E+00 | -- | -- | na | 6.6E+03 | **--** | **--** | **na** | **6.6E+03** |
| Thallium | 0 | -- | -- | na | 4.7E-01 | -- | -- | na | 2.4E+02 | -- | -- | na | 4.7E-02 | -- | -- | na | 2.4E+01 | **--** | **--** | **na** | **2.4E+01** |
| Toluene | 0 | -- | -- | na | 6.0E+03 | -- | -- | na | 3.1E+06 | -- | -- | na | 6.0E+02 | -- | -- | na | 3.1E+05 | **--** | **--** | **na** | **3.1E+05** |
| Total dissolved solids | 0 | -- | -- | na | -- | -- | -- | na | -- | -- | -- | na | -- | -- | -- | na | -- | **--** | **--** | **na** | **--** |
| Toxaphene [C] | 0 | 7.3E-01 | 2.0E-04 | na | 2.8E-03 | 2.6E+01 | 4.5E-02 | na | 5.6E+00 | 1.8E-01 | 5.0E-05 | na | 2.8E-04 | 2.9E+01 | 1.1E-02 | na | 5.6E-01 | **2.6E+01** | **1.1E-02** | **na** | **5.6E-01** |
| Tributyltin | 0 | 4.6E-01 | 7.2E-02 | na | -- | 1.6E+01 | 1.6E+01 | na | -- | 1.2E-01 | 1.8E-02 | na | -- | 1.9E+01 | 4.1E+00 | na | -- | **1.6E+01** | **4.1E+00** | **na** | **--** |
| 1,2,4-Trichlorobenzene | 0 | -- | -- | na | 7.0E+01 | -- | -- | na | 3.6E+04 | -- | -- | na | 7.0E+00 | -- | -- | na | 3.6E+03 | **--** | **--** | **na** | **3.6E+03** |
| 1,1,2-Trichloroethane[C] | 0 | -- | -- | na | 1.6E+02 | -- | -- | na | 3.2E+05 | -- | -- | na | 1.6E+01 | -- | -- | na | 3.2E+04 | **--** | **--** | **na** | **3.2E+04** |
| Trichloroethylene [C] | 0 | -- | -- | na | 3.0E+02 | -- | -- | na | 6.0E+05 | -- | -- | na | 3.0E+01 | -- | -- | na | 6.0E+04 | **--** | **--** | **na** | **6.0E+04** |
| 2,4,6-Trichlorophenol [C] | 0 | -- | -- | na | 2.4E+01 | -- | -- | na | 4.8E+04 | -- | -- | na | 2.4E+00 | -- | -- | na | 4.8E+03 | **--** | **--** | **na** | **4.8E+03** |
| 2-(2,4,5-Trichlorophenoxy) propionic acid (Silvex) | 0 | -- | -- | na | -- | -- | -- | na | -- | -- | -- | na | -- | -- | -- | na | -- | **--** | **--** | **na** | **--** |
| Vinyl Chloride[C] | 0 | -- | -- | na | 2.4E+01 | -- | -- | na | 4.8E+04 | -- | -- | na | 2.4E+00 | -- | -- | na | 4.8E+03 | **--** | **--** | **na** | **4.8E+03** |
| Zinc | 0 | 6.5E+01 | 6.6E+01 | na | 2.6E+04 | 2.3E+03 | 1.5E+04 | na | 1.4E+07 | 1.6E+01 | 1.6E+01 | na | 2.6E+03 | 2.6E+03 | 3.7E+03 | na | 1.4E+06 | **2.3E+03** | **3.7E+03** | **na** | **1.4E+06** |

Notes:

1. All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise
2. Discharge flow is highest monthly average or Form 2C maximum for Industries and design flow for Municipals
3. Metals measured as Dissolved, unless specified otherwise
4. "C" indicates a carcinogenic parameter
5. Regular WLAs are mass balances (minus background concentration) using the % of stream flow entered above under Mixing Information.
   Antidegradation WLAs are based upon a complete mix.
6. Antideg. Baseline = (0.25(WQC - background conc.) + background conc.) for acute and chronic
   = (0.1(WQC - background conc.) + background conc.) for human health
7. WLAs established at the following stream flows: 1Q10 for Acute, 30Q10 for Chronic Ammonia, 7Q10 for Other Chronic, 30Q5 for Non-carcinogens and Harmonic Mean for Carcinogens. To apply mixing ratios from a model set the stream flow equal to (mixing ratio - 1), effluent flow equal to 1 and 100% mix.

| Metal | Target Value (SSTV) |
|---|---|
| Antimony | 3.3E+04 |
| Arsenic | 4.8E+03 |
| Barium | na |
| Cadmium | 2.2E+01 |
| Chromium III | 1.4E+03 |
| Chromium VI | 2.3E+02 |
| Copper | 9.9E+01 |
| Iron | na |
| Lead | 1.9E+02 |
| Manganese | na |
| Mercury | 2.0E+01 |
| Nickel | 3.8E+02 |
| Selenium | 1.7E+02 |
| Silver | 1.5E+01 |
| Zinc | 9.2E+02 |

Note: do not use QL's lower than the minimum QL's provided in agency guidance

Mixing Zone Predictions for Hartland Institue

Effluent Flow = 0.025 MGD
Stream 7Q10 = 5.6 MGD
Stream 30Q10 = 9.4 MGD
Stream 1Q10 = 4.0 MGD
Stream slope = 0.001 ft/ft
Stream width = 50 ft
Bottom scale = 3
Channel scale = 1

---

Mixing Zone Predictions @ 7Q10

Depth = .5879 ft
Length = 3660.57 ft
Velocity = .2961 ft/sec
Residence Time = .1431 days

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 7Q10 may be used.

---

Mixing Zone Predictions @ 30Q10

Depth = .8044 ft
Length = 2802.02 ft
Velocity = .3627 ft/sec
Residence Time = .0894 days

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 30Q10 may be used.

---

Mixing Zone Predictions @ 1Q10

Depth = .4804 ft
Length = 4342.36 ft
Velocity = .2594 ft/sec
Residence Time = 4.6497 hours

Recommendation:

A complete mix assumption is appropriate for this situation providing no more than 21.51% of the 1Q10 is used.

---

3/17/2011 11:31:43 AM

Facility = Hartland Institute
Chemical = Ammonia
Chronic averaging period = 30
WLAa = 700
WLAc = 210
Q.L. = .2
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

# observations = 1
Expected Value = 9
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average= 10.8544
# < Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

9

4/25/2006 4:51:51 PM

Facility = Hartland Institute
Chemical = Ammonia
Chronic averaging period = 30
WLAa = 1400
WLAc =
Q.L. = .2
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

# observations = 1
Expected Value = 9
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average= 10.8544
# < Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

9

5/9/2011 9:26:28 AM

Facility = Hartland Institute
Chemical = TRC
Chronic averaging period = 4
WLAa = 4
WLAc = 4
Q.L. = .1
# samples/mo. = 28
# samples/wk. = 7

Summary of Statistics:

# observations = 1
Expected Value = .2
Variance = .0144
C.V. = 0.6
97th percentile daily values = .486683
97th percentile 4 day average = .332758
97th percentile 30 day average= .241210
# < Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

0.2

Analysis of the Hartland Institute effluent data for TRC
Averaging period for standard = 4 days

The statistics for TRC are:
Number of values = 1
Quantification level = .1
Number < quantification = 0
Expected value = 5
Variance = 9
C.V. = .6
97th percentile = 12.16709
Statistics used = Reasonable potential assumptions - Type 2 data

The WLAs for TRC are:
Acute WLA = .1
Chronic WLA = 2.78
Human Health WLA = ----

Limits are based on acute toxicity and 30 samples/month, 7 samples/week

Maximum daily limit = 9.999999E-02
Average weekly limit = 6.107072E-02 ≈ 0.06 mg/l
Average monthly limit = 4.956212E-02 ≈ 0.05 mg/l

Note: The maximum daily limit applies to industrial dischargers
The average weekly limit applies to POTWs
The average monthly limit applies to both.

The Data are
5

Analysis of the Hartland Institute effluent data for TRC
Averaging period for standard = 4 days

The statistics for TRC are:
Number of values = 1
Quantification level = .1
Number < quantification = 0
Expected value = 5
Variance = 9
C.V. = .6
97th percentile = 12.16709
Statistics used = Reasonable potential assumptions - Type 2 data

The WLAs for TRC are:
Acute WLA = .1
Chronic WLA = 1.4
Human Health WLA = ----

Limits are based on acute toxicity and 30 samples/month, 7 samples/week

Maximum daily limit = 9.999999E-02
Average weekly limit = 6.107072E-02 ≈ 0.06 mg/l
Average monthly limit = 4.956212E-02 ≈ 0.05 mg/l

Note: The maximum daily limit applies to industrial dischargers
The average weekly limit applies to POTWs
The average monthly limit applies to both.

The Data are
5

## Calculation of Total Residual Chlorine

**Facility Name: Hartland Institute of Health and Education WWTP**
**VPDES Permit No: VA0068951**

Assumimg a background value of 0:

**0.025 MGD Facility:**

**ACUTE**

$$WQ\text{-}WLA = Ao_d \frac{(Qs\text{-}1_{dry} + Qe)}{Qe}$$

$$WQ\text{-}WLA_{ad} = (0.019)(4.5 + 0.025)/0.025 = \mathbf{3.44\ mg/l}$$

**CHRONIC**

$$AWLA_{cd} = Co_d \frac{(Qs\text{-}7_{dry} + Qe)}{Qe}$$

$$AWLA_{cd} = (0.011)(6.3 + 0.025)/0.025 = \mathbf{2.78\ mg/l}$$

---

**0.050 MGD FACILITY**

**ACUTE**

$$WQ\text{-}WLA = Ao_d \frac{(Qs\text{-}1_{dry} + Qe)}{Qe}$$

$$WQ\text{-}WLA_{ad} = (0.019)(4.5 + 0.050)/0.050 = \mathbf{1.73\ mg/l}$$

**CHRONIC**

$$AWLA_{cd} = Co_d \frac{(Qs\text{-}7_{dry} + Qe)}{Qe}$$

$$AWLA_{cd} = (0.011)(6.3 + 0.050)/0.050 = \mathbf{1.40\ mg/l}$$

The effluent limitations were calculated using the new WLA322 Program. See attached computer printout on the next page.

# STREAM ASSIMILATION ANALYSIS

Attachment 9

Stream: Robinson-Rapidan Rivers

Discharge: Hartland Hall Plantation

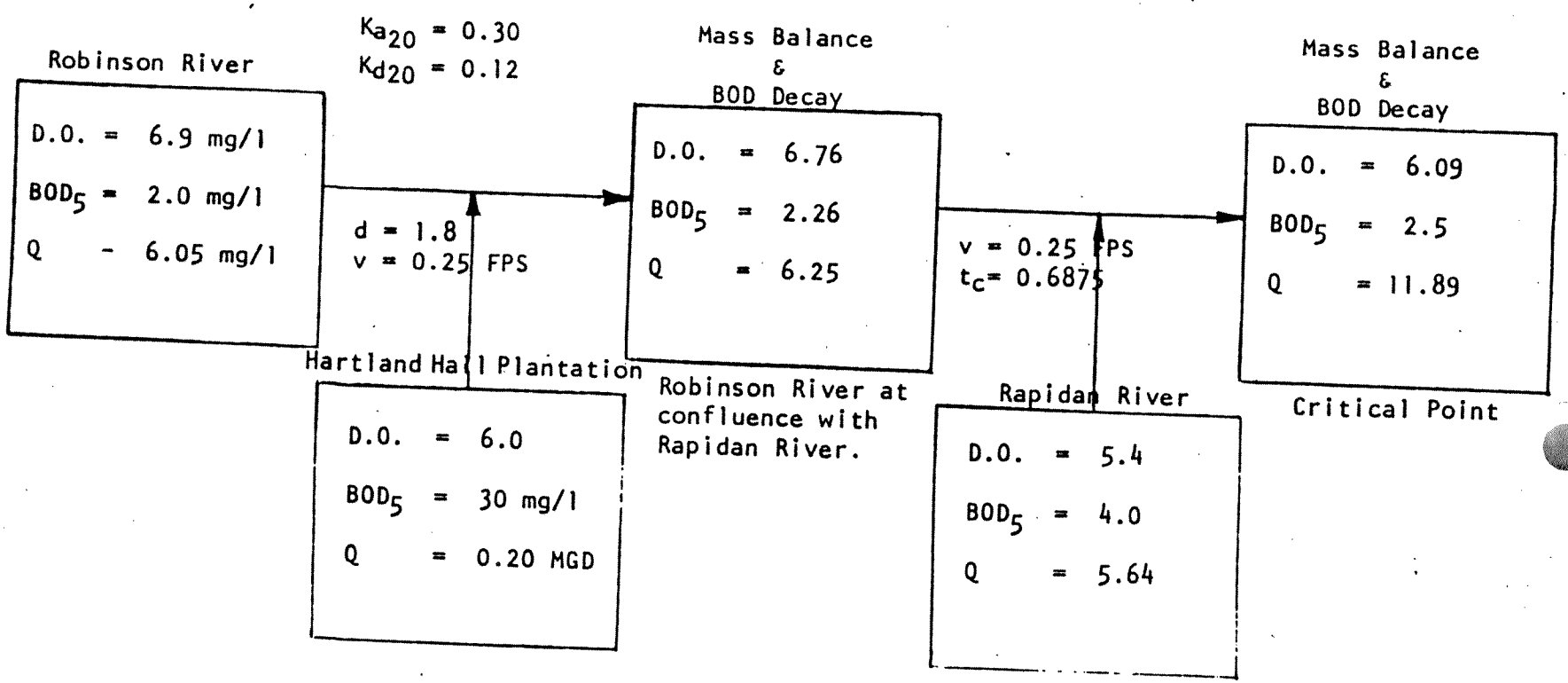
Topo Sheet:
Critical Discharge:
Gauging Station:

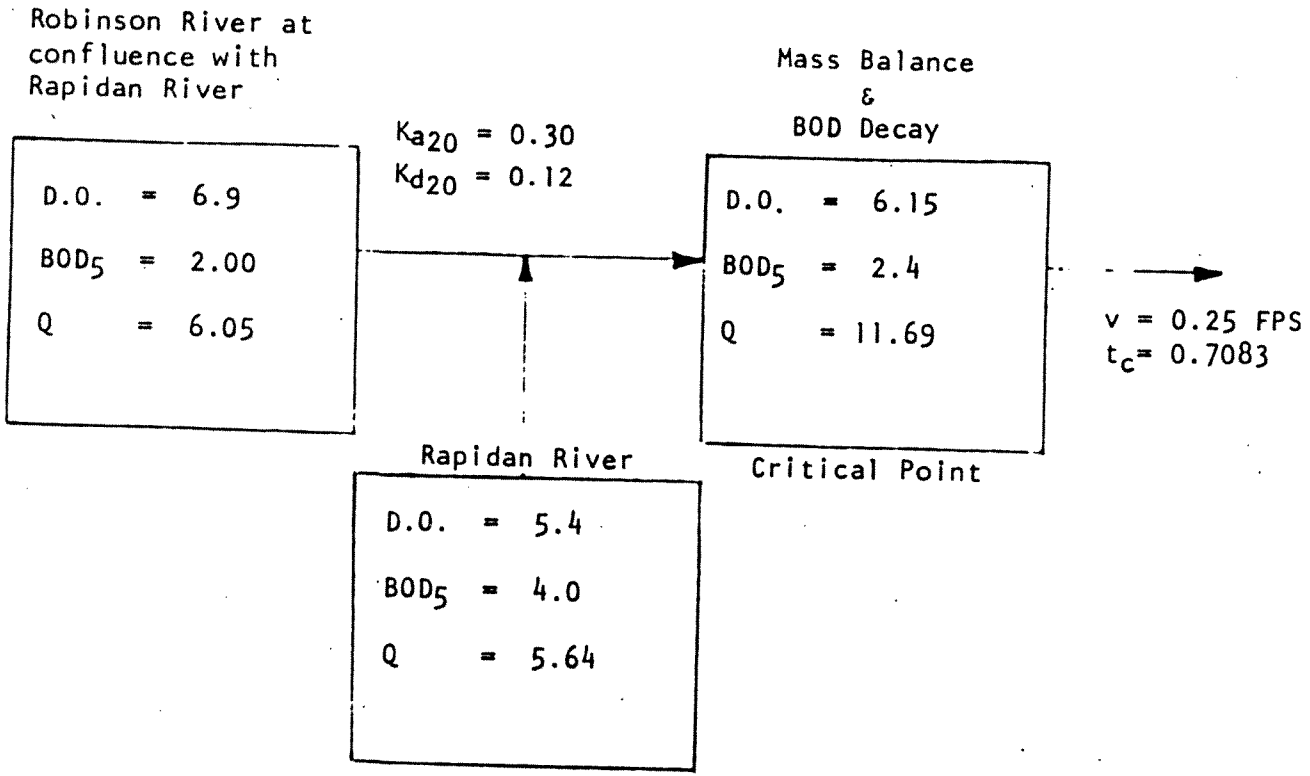
| Computation Number ..... | Robinson | Robinson | | Robinson |
|---|---|---|---|---|
| Drainage Area ..... | Discharge | Rapidan | | Rapidan |
| Stream temperature ..... | 30°C | 30°C | | 30°C |
| Saturation D.O. ..... | 7.6 | 7.6 | | 7.6 |
| D.O. Discharge ..... | 6.0 | 5.4 | | 5.4 |
| $K_1$ (carbonacious)..... | 0.12 | 0.12 | | 0.12 |
| $K_n$ (nitrogenous) ..... | 0.0 | 0.0 | | 0.0 |
| $K_2$ (reaeration) ..... | 0.30 | 0.30 | | 0.30 |
| Flow, mgd (discharge) ..... | 0.20 | 5.64 | | 5.64 |
| $BOD_5$ (discharge) ..... | 30 | 4.0 | | 4.0 |
| $NOD_u$ (discharge ..... | 0.0 | 0.0 | | 0.0 |
| Flow, mgd (stream)..... | 6.05 | 6.25 | | 6.05 |
| $BOD_5$ (stream) ..... | 2.0 | 2.265 | | 2.0 |
| $NOD_u$ (stream) ..... | 0.0 | 0.0 | | 0.0 |
| Length of segment (mi) ..... | 1.8 | 5.0 | | 5.0 |
| Velocity of stream (fps) ... | 0.25 | 0.25 | | 0.25 |
| D.O. (allowable) ..... | 6.7 | 6.7 | | 6.7 |
| D.O. (stream) ..... | 6.9 | 6.77 | | 6.9 |
| $\Delta$ D.O. from allowable ..... (Red indicates violation) | 0.065 | -0.60 | | -0.55 |
| Flow (combined)..... | 6.25 | 11.89 | | 11.69 |
| $BOD_5$ decay @ t ..... | 2.265 | 2.49 | | 2.40 |
| $NOD_u$ decay @ t ..... | 0.0 | 0.0 | | 0.0 |
| time, days ..... | 0.43 | 0.687 | | 0.708 |
| D.O. @ t ("A" indicates ... Critical D.O.) | 6.765 | 6.09 | | 6.15 |

Note: At the end of each segment, if critical D.O. has not been reached, the next stream segment should be analyzed. The parameter values determined @ time = t become the new "stream" data and new flows introduced to the stream (eg: tributaries, STP discharges, stretch flows) become the new "discharge" data. [$K_1$, $K_n$ and $K_2$ must be adjusted as necessary]

mgd = (.646)cfs

Reviewer:


Robinson River
D.O. = 6.9 mg/l
BOD5 = 2.0 mg/l
Q - 6.05 mg/l
Ka20 = 0.30
Kd20 = 0.12
d = 1.8
v = 0.25 FPS
Hartland Hall Plantation
D.O. = 6.0
BOD5 = 30 mg/l
Q = 0.20 MGD
Mass Balance
&
BOD Decay
D.O. = 6.76
BOD5 = 2.26
Q = 6.25
Robinson River at confluence with Rapidan River.
v = 0.25 FPS
tc = 0.6875
Rapidan River
D.O. = 5.4
BOD5 = 4.0
Q = 5.64
Mass Balance
&
BOD Decay
D.O. = 6.09
BOD5 = 2.5
Q = 11.89
Critical Point


Robinson River at confluence with Rapidan River
D.O. = 6.9
BOD5 = 2.00
Q = 6.05
Ka20 = 0.30
Kd20 = 0.12
Mass Balance & BOD Decay
D.O. = 6.15
BOD5 = 2.4
Q = 11.69
Critical Point
v = 0.25 FPS
tc = 0.7083
Rapidan River
D.O. = 5.4
BOD5 = 4.0
Q = 5.64

Public Notice – Environmental Permit

PURPOSE OF NOTICE: To seek public comment on a draft permit from the Department of Environmental Quality that will allow the release of treated wastewater into a water body in Madison County Virginia.

PUBLIC COMMENT PERIOD: June 17, 2011 to 5:00 p.m. on July 18, 2011

PERMIT NAME: Virginia Pollutant Discharge Elimination System Permit – Wastewater issued by DEQ, under the authority of the State Water Control Board

APPLICANT NAME, ADDRESS AND PERMIT NUMBER: Hartland Institute, P.O. Box 1, Rapidan, VA 22733 VA0068951

NAME AND ADDRESS OF FACILITY: Hartland Institute, Route 614 E., Rapidan, VA 22733

PROJECT DESCRIPTION: Hartland Institute has applied for a reissuance of a permit for the private Hartland Institute STP. The applicant proposes to release treated sewage wastewater from a religious retreat that includes some residential areas at a rate of 0.025 million gallons per day into a water body. The sludge will be disposed by transfer to the Town of Culpeper WWTP. The facility proposes to release the sewage into the Robinson River in Madison County in the Rappahannock River watershed. A watershed is the land area drained by a river and its incoming streams. The permit will limit the following pollutants to amounts that protect water quality: pH, $BOD_5$, Total Suspended Solids, Dissolved Oxygen, *E. coli*, and Total Residual Chlorine.

HOW TO COMMENT AND/OR REQUEST A PUBLIC HEARING: DEQ accepts comments and requests for public hearing by e-mail, fax or postal mail. All comments and requests must be in writing and be received by DEQ during the comment period. Submittals must include the names, mailing addresses and telephone numbers of the commenter/requester and of all persons represented by the commenter/requester. A request for public hearing must also include: 1) The reason why a public hearing is requested. 2) A brief, informal statement regarding the nature and extent of the interest of the requester or of those represented by the requestor, including how and to what extent such interest would be directly and adversely affected by the permit. 3) Specific references, where possible, to terms and conditions of the permit with suggested revisions. If public response is significant and there are substantial, disputed issues relevant to the permit,, a public hearing, to include another comment period, may be held based on individual requests for a public hearing,

CONTACT FOR PUBLIC COMMENTS, DOCUMENT REQUESTS AND ADDITIONAL INFORMATION: The public may review the documents at the DEQ Northern Regional Office by appointment or may request electronic copies of the draft permit and fact sheet.
Name: Anna T. Westernik
13901 Crown Court, Woodbridge, VA 22193
Phone: (703) 583-3837 E-mail: anna.westernik@deq.virginia.gov Fax: (703) 583-3821

**Attachment 10**

## APPENDIX A
## SCHEDULE OF COMPLIANCE

Hartland Institute agrees to:

1. Remove and inspect the lagoon curtain and either provide written/photographic proof to DEQ that it does not need to be replaced at this time or replace it with a new curtain by April 18, 2008.

2. Lock the valves to the old lagoon so that there is no possibility of discharge to that lagoon.

3. Upon completion of the collection system evaluation but no later than July 31, 2008, review the current O&M Manual and revise it so that it reflects the current system at Hartland.

4. Immediately evaluate the current Facility collection system including:

    a. Submitting to DEQ a current map of the existing collection system that includes all buildings, single family homes, trailers and any other structures connected to the system; number of homes not connected to the system; pump stations; manholes; clean outs; a breakdown of materials used in the collection system by linear feet; buried versus unburied pipes; and downspouts, sump pumps or drains from buildings that are tied into the collection system;
    b. Submitting to DEQ a plan for the implementation of a maintenance program for the system in order to prevent system failures or overflows;
    c. Submitting to DEQ the population of the Institute that includes the number of permanent residents at the facility and the number of day staff;
    d. Submitting to DEQ any future building plans and their capacities that are planned to be connected to the existing system;
    e. Providing copies of all VDH permits for past connections or any planned new connections.

    Hartland shall submit a report of the collection system evaluation to DEQ, for review and approval, by April 30, 2008. Hartland shall include within said report any recommendations for maintenance or system improvements that it believes are necessary to ensure that overflows or blockages of the system do not occur and a schedule for performance of said maintenance or improvements. If further analysis or evaluation is necessary, Hartland shall provide DEQ with a timeline for these actions by April 30, 2008. Upon review and approval by DEQ, Hartland shall implement said recommendations in accordance with the approved timelines.

5. Within 60 days of DEQ approval of the collection system evaluation, the collection system shall be evaluated by an independent engineer to assess the adequacy of the collection system for Hartland Institute. The independent engineer evaluation shall be submitted to DEQ for review.

6. Evaluate the current lagoon aeration system and ensure that it is sufficient to meet Permit effluent limits. The evaluation shall include inspecting the functioning of the aeration system and confirmation that the blowers and diffusers are of sufficient size, number and state of repair to ensure that the aeration system is capable of treating the volume and strength of the wastewater that it currently can be expected to receive. Submit a report to DEQ, for its review and approval, on the sufficiency of the current aeration system by July 31, 2008, including a plan for any upgrades or maintenance to the system necessary to ensure compliance with Permit requirements. If maintenance or restoration to the current system is necessary, this work shall be completed by July 31, 2008. If further upgrades are required for the system, Hartland shall submit the appropriate plans and specifications to DEQ within 60 days of approval of the upgrade plan.

7. Certify to DEQ by April 18, 2008, that safe and easy access has been provided to the Facility outfall so that wastewater samples can easily be taken when necessary. Hartland shall provide visual confirmation of safe access at the time that certification is provided.

8. Upon completion of the collection system evaluation and corrective action discussed in paragraphs 4 and 5 above, but no later than July 15, 2008, perform an influent BOD sample and submit the results to DEQ. This sample may be used for the annual influent BOD sample that is required in the permit.

9. Continue to sample two times per month for BOD, TSS and E. coli as was begun in November 2007. The two samples shall not be collected in the same week and must be taken in a full 7-day week. Hartland shall continue to sample two times per month for 6 months, or until May 1, 2008.

10. Keep onsite the following records at all times:
    a. A current O&M Manual
    b. Chain of custody forms
    c. Records of Facility operations and maintenance for the past 6 months (records for the past 3 years must be kept as well though not necessarily onsite)
    d. Certificates of analysis
    e. A copy of the Permit

11. Keep a log book on site at the Facility at all times to record observations of Facility conditions, sampling events, maintenance tasks performed and operational issues or problems and their resolutions.

Revised 2/2003

***State "Transmittal Checklist" to Assist in Targeting***
***Municipal and Industrial Individual NPDES Draft Permits for Review***

**Part I. State Draft Permit Submission Checklist**

In accordance with the MOA established between the Commonwealth of Virginia and the United States Environmental Protection Agency, Region III, the Commonwealth submits the following draft National Pollutant Discharge Elimination System (NPDES) permit for Agency review and concurrence.

| | |
|---|---|
| Facility Name: | Hartland Institute |
| NPDES Permit Number: | VA00068951 |
| Permit Writer Name: | Anna Westernik |
| Date: | March 22, 2011 |

**Major** [ ] **Minor** [X ] **Industrial** [ ] **Municipal** [ x ]

| **I.A. Draft Permit Package Submittal Includes:** | **Yes** | **No** | **N/A** |
|---|---|---|---|
| 1. Permit Application? | x | | |
| 2. Complete Draft Permit (for renewal or first time permit – entire permit, including boilerplate information)? | x | | |
| 3. Copy of Public Notice? | x | | |
| 4. Complete Fact Sheet? | x | | |
| 5. A Priority Pollutant Screening to determine parameters of concern? | x | | |
| 6. A Reasonable Potential analysis showing calculated WQBELs? | x | | |
| 7. Dissolved Oxygen calculations? | x | | |
| 8. Whole Effluent Toxicity Test summary and analysis? | | x | |
| 9. Permit Rating Sheet for new or modified industrial facilities? | | | x |

| **I.B. Permit/Facility Characteristics** | **Yes** | **No** | **N/A** |
|---|---|---|---|
| 1. Is this a new, or currently unpermitted facility? | | x | |
| 2. Are all permissible outfalls (including combined sewer overflow points, non-process water and storm water) from the facility properly identified and authorized in the permit? | x | | |
| 3. Does the fact sheet **or** permit contain a description of the wastewater treatment process? | x | | |
| 4. Does the review of PCS/DMR data for at least the last 3 years indicate significant non-compliance with the existing permit? | x | | |
| 5. Has there been any change in streamflow characteristics since the last permit was developed? | | x | |
| 6. Does the permit allow the discharge of new or increased loadings of any pollutants? | | x | |
| 7. Does the fact sheet **or** permit provide a description of the receiving water body(s) to which the facility discharges, including information on low/critical flow conditions and designated/existing uses? | x | | |
| 8. Does the facility discharge to a 303(d) listed water? | x | | |
| a. Has a TMDL been developed and approved by EPA for the impaired water? | x | | |
| b. Does the record indicate that the TMDL development is on the State priority list and will most likely be developed within the life of the permit? | | | x |
| c. Does the facility discharge a pollutant of concern identified in the TMDL or 303(d) listed water? | x | | |
| 9. Have any limits been removed, or are any limits less stringent, than those in the current permit? | | x | |
| 10. Does the permit authorize discharges of storm water? | | x | |
| | | | |

| I.B. Permit/Facility Characteristics – cont. | Yes | No | N/A |
|---|---|---|---|
| 11. Has the facility substantially enlarged or altered its operation or substantially increased its flow or production? | | x | |
| 12. Are there any production-based, technology-based effluent limits in the permit? | x | | |
| 13. Do any water quality-based effluent limit calculations differ from the State's standard policies or procedures? | | x | |
| 14. Are any WQBELs based on an interpretation of narrative criteria? | | x | |
| 15. Does the permit incorporate any variances or other exceptions to the State's standards or regulations? | | x | |
| 16. Does the permit contain a compliance schedule for any limit or condition? | | x | |
| 17. Is there a potential impact to endangered/threatened species or their habitat by the facility's discharge(s)? | x | | |
| 18. Have impacts from the discharge(s) at downstream potable water supplies been evaluated? | x | | |
| 19. Is there any indication that there is significant public interest in the permit action proposed for this facility? | | x | |
| 20. Have previous permit, application, and fact sheet been examined? | x | | |

**Part II. NPDES Draft Permit Checklist**

**Region III NPDES Permit Quality Checklist – for POTWs**

*(To be completed and included in the record only for POTWs)*

| II.A. Permit Cover Page/Administration | Yes | No | N/A |
|---|---|---|---|
| 1. Does the fact sheet or permit describe the physical location of the facility, including latitude and longitude (not necessarily on permit cover page)? | x | | |
| 2. Does the permit contain specific authorization-to-discharge information (from where to where, by whom)? | x | | |

| II.B. Effluent Limits – General Elements | Yes | No | N/A |
|---|---|---|---|
| 1. Does the fact sheet describe the basis of final limits in the permit (e.g., that a comparison of technology and water quality-based limits was performed, and the most stringent limit selected)? | x | | |
| 2. Does the fact sheet discuss whether "antibacksliding" provisions were met for any limits that are less stringent than those in the previous NPDES permit? | | | x |

| II.C. Technology-Based Effluent Limits (POTWs) | Yes | No | N/A |
|---|---|---|---|
| 1. Does the permit contain numeric limits for ALL of the following: BOD (or alternative, e.g., CBOD, COD, TOC), TSS, and pH? | x | | |
| 2. Does the permit require at least 85% removal for BOD (or BOD alternative) and TSS (or 65% for equivalent to secondary) consistent with 40 CFR Part 133? | x | | |
| a. If no, does the record indicate that application of WQBELs, or some other means, results in more stringent requirements than 85% removal or that an exception consistent with 40 CFR 133.103 has been approved? | | | x |
| 3. Are technology-based permit limits expressed in the appropriate units of measure (e.g., concentration, mass, SU)? | x | | |
| 4. Are permit limits for BOD and TSS expressed in terms of both long term (e.g., average monthly) and short term (e.g., average weekly) limits? | x | | |
| 5. Are any concentration limitations in the permit less stringent than the secondary treatment requirements (30 mg/l BOD5 and TSS for a 30-day average and 45 mg/l BOD5 and TSS for a 7-day average)? | | x | |
| a. If yes, does the record provide a justification (e.g., waste stabilization pond, trickling filter, etc.) for the alternate limitations? | | | x |

| II.D. Water Quality-Based Effluent Limits | Yes | No | N/A |
|---|---|---|---|
| 1. Does the permit include appropriate limitations consistent with 40 CFR 122.44(d) covering State narrative and numeric criteria for water quality? | x | | |
| 2. Does the fact sheet indicate that any WQBELs were derived from a completed and EPA approved TMDL? (monitoring for PCBs only) | x | | |
| 3. Does the fact sheet provide effluent characteristics for each outfall? | x | | |
| 4. Does the fact sheet document that a "reasonable potential" evaluation was performed? | x | | |
| a. If yes, does the fact sheet indicate that the "reasonable potential" evaluation was performed in accordance with the State's approved procedures? | x | | |
| b. Does the fact sheet describe the basis for allowing or disallowing in-stream dilution or a mixing zone? | x | | |
| c. Does the fact sheet present WLA calculation procedures for all pollutants that were found to have "reasonable potential"? | x | | |
| d. Does the fact sheet indicate that the "reasonable potential" and WLA calculations accounted for contributions from upstream sources (i.e., do calculations include ambient/background concentrations)? | | x | |
| e. Does the permit contain numeric effluent limits for all pollutants for which "reasonable potential" was determined? | x | | |

| II.D. Water Quality-Based Effluent Limits – cont. | Yes | No | N/A |
|---|---|---|---|
| 5. Are all final WQBELs in the permit consistent with the justification and/or documentation provided in the fact sheet? | x | | |
| 6. For all final WQBELs, are BOTH long-term AND short-term effluent limits established? | x | | |
| 7. Are WQBELs expressed in the permit using appropriate units of measure (e.g., mass, concentration)? | x | | |
| 8. Does the record indicate that an "antidegradation" review was performed in accordance with the State's approved antidegradation policy? | x | | |

| II.E. Monitoring and Reporting Requirements | Yes | No | N/A |
|---|---|---|---|
| 1. Does the permit require at least annual monitoring for all limited parameters and other monitoring as required by State and Federal regulations? | x | | |
| a. If no, does the fact sheet indicate that the facility applied for and was granted a monitoring waiver, AND, does the permit specifically incorporate this waiver? | | | |
| 2. Does the permit identify the physical location where monitoring is to be performed for each outfall? | x | | |
| 3. Does the permit require at least annual influent monitoring for BOD (or BOD alternative) and TSS to assess compliance with applicable percent removal requirements? | x | | |
| 4. Does the permit require testing for Whole Effluent Toxicity? | | x | |

| II.F. Special Conditions | Yes | No | N/A |
|---|---|---|---|
| 1. Does the permit include appropriate biosolids use/disposal requirements? | x | | |
| 2. Does the permit include appropriate storm water program requirements?* | | | x |

| II.F. Special Conditions – cont. | Yes | No | N/A |
|---|---|---|---|
| 3. If the permit contains compliance schedule(s), are they consistent with statutory and regulatory deadlines and requirements? | | | x |
| 4. Are other special conditions (e.g., ambient sampling, mixing studies, TIE/TRE, BMPs, special studies) consistent with CWA and NPDES regulations? | x | | |
| 5. Does the permit allow/authorize discharge of sanitary sewage from points other than the POTW outfall(s) or CSO outfalls [i.e., Sanitary Sewer Overflows (SSOs) or treatment plant bypasses]? | | x | |
| 6. Does the permit authorize discharges from Combined Sewer Overflows (CSOs)? | | x | |
| a. Does the permit require implementation of the "Nine Minimum Controls"? | | | x |
| b. Does the permit require development and implementation of a "Long Term Control Plan"? | | | x |
| c. Does the permit require monitoring and reporting for CSO events? | | | x |
| 7. Does the permit include appropriate Pretreatment Program requirements? | x | | |

*Requirements in Storm Water General Permit

| II.G. Standard Conditions | Yes | No | N/A |
|---|---|---|---|
| 1. Does the **permit** contain all 40 CFR 122.41 standard conditions or the State equivalent (or more stringent) conditions? | x | | |

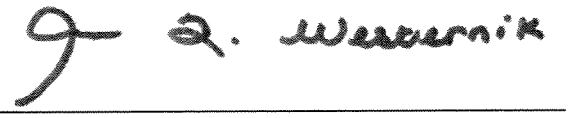
**List of Standard Conditions – 40 CFR 122.41**

| | | |
|---|---|---|
| Duty to comply | Property rights | Reporting Requirements |
| Duty to reapply | Duty to provide information | Planned change |
| Need to halt or reduce activity not a defense | Inspections and entry | Anticipated noncompliance |
| | Monitoring and records | Transfers |
| Duty to mitigate | Signatory requirement | Monitoring reports |
| Proper O & M | Bypass | Compliance schedules |
| Permit actions | Upset | 24-Hour reporting |
| | | Other non-compliance |

| | | | |
|---|---|---|---|
| 2. Does the permit contain the additional standard condition (or the State equivalent or more stringent conditions) for POTWs regarding notification of new introduction of pollutants and new industrial users [40 CFR 122.42(b)]? | x | | |

**Part III. Signature Page**

Based on a review of the data and other information submitted by the permit applicant, and the draft permit and other administrative records generated by the Department/Division and/or made available to the Department/Division, the information provided on this checklist is accurate and complete, to the best of my knowledge.

| | |
|---|---|
| Name | Anna Westernik |
| Title | Environmental Specialist II |
| Signature |  |
| Date | March 22, 2011 |